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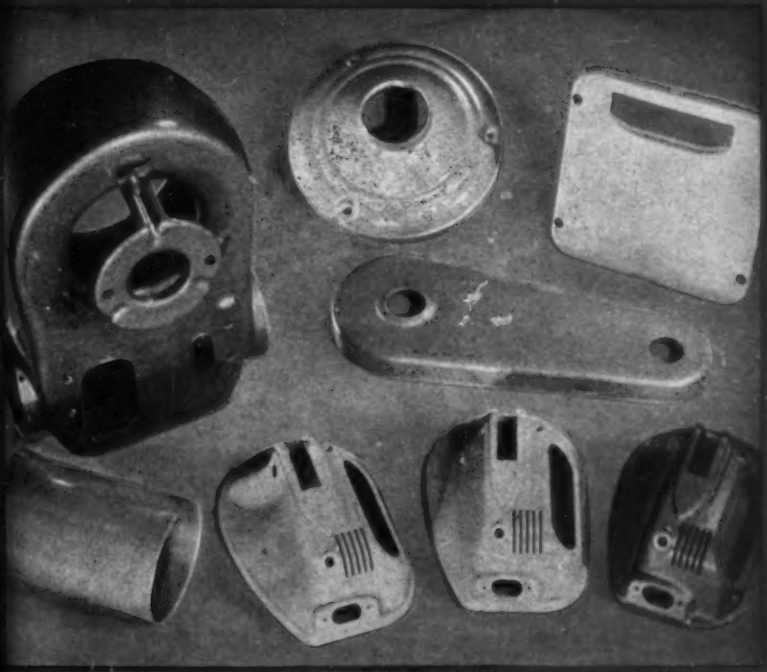

Progress in Metals and Alloys—Page 53

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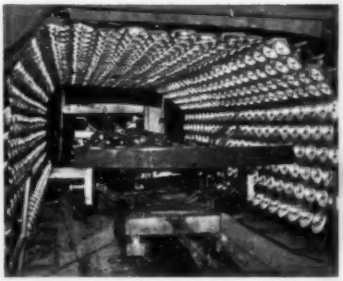

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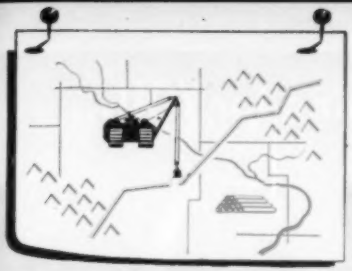

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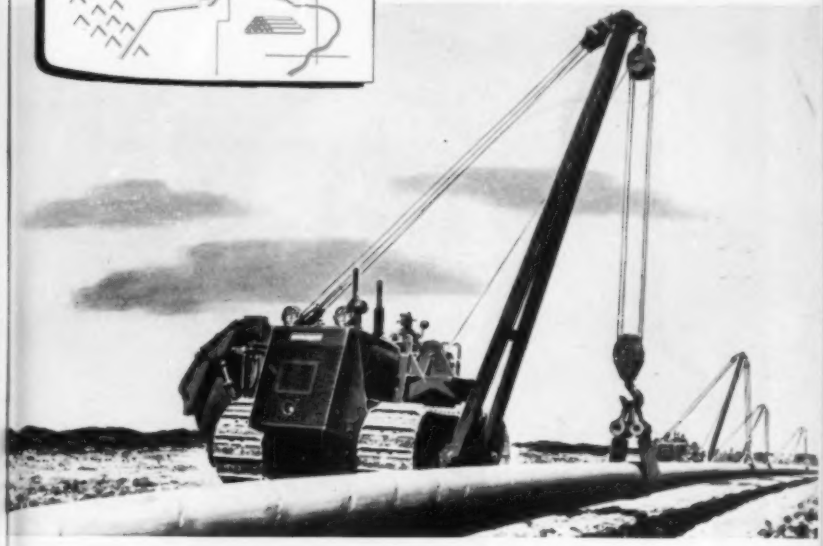

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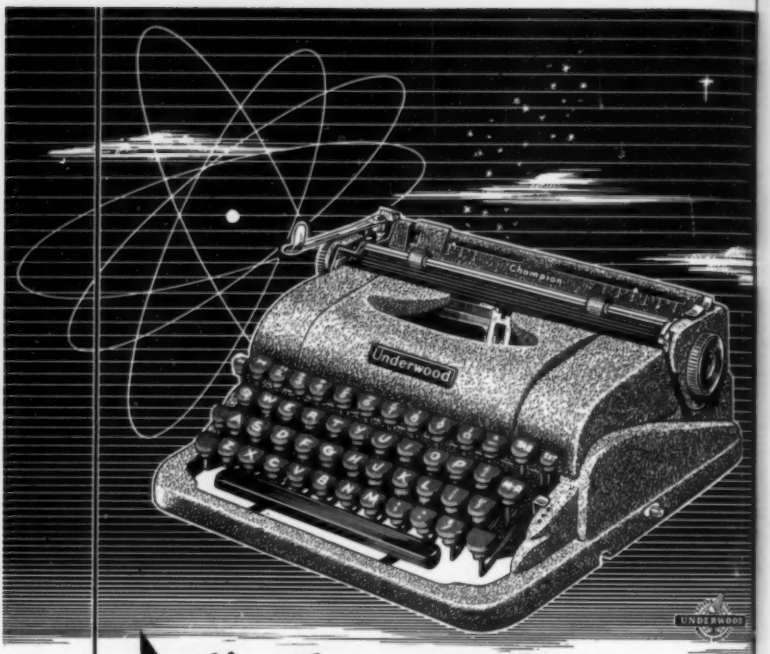

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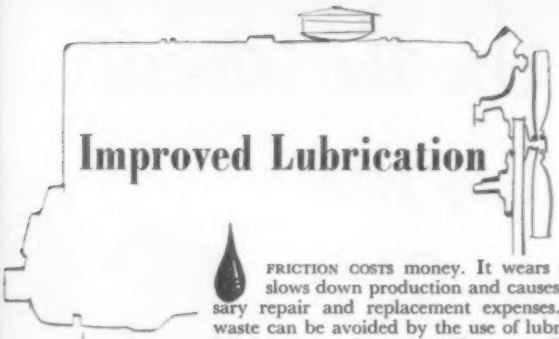

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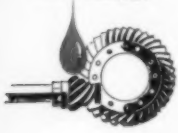

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Business Trends

VICTORY IN KOREA will not stop the U. S. rearmament boom. The U. S. is mobilizing to meet future Red-inspired threats. So the outlook is still for inflation, controls, and world shortages of raw materials.

The United Nations' triumph may slow inflation and delay controls temporarily. Prices, especially of imported commodities, are rising less rapidly now. Slowing down of the inflation pace takes some pressure off the need for economic controls.

But the slackening will be slight; the trend of U. S. prices is still upward. Mounting military spending and growing civilian demand by both consumer and business (business is spending heavily for plant and equipment) will push prices up faster next year, force adoption of strict controls.

Military contracts are flowing in volume now—at the rate of $3-billion a month. Most of these contracts go to big companies. Full-scale military production will not start until small business goes to work on subcontracts.

Civilians will get fewer goods as military production goes up. Key materials will be siphoned off at an increasing rate. The military now takes only 2% of U. S. steel today, will get 10% by next June. The military share of copper will rise from 6-7% to 22-23%, aluminum from 8% to 23-24%.

Military demands are expected to cut production of metal-using consumer goods an average of 10%. Output of some will drop more; appliances, which use a lot of copper, may be reduced 20% next year.

Over-all U. S. production is rising. But production is running into a big snag—manpower. With only about 2-million unemployed, the supply of skilled workers is nearly exhausted and all labor is scarce.

Basic industries also limit growth of production. Steel, nonferrous metals, chemicals are all operating at capacity and cannot expand output fast enough to meet the need.

U. S. DEMAND for raw materials and imported commodities is already immense and will grow as defense production mushrooms.

- **Cadmium** production is far behind needs. Mexico has shipped little.
- **Bismuth** is getting scarce; more goes into alloys to replace tin.
- **Nickel** is hard to find, has been under allocation for months.
- **Quicksilver** is in great demand, but U. S. has a large supply in reserve.
- **Copper** is a key military material. Supplies are inadequate.
- **Zinc** supplies are low. U. S. has a stockpile, but wants to hold it.

Stepped-up government buying will complicate the raw-materials situation. U. S. stockpiles of strategic materials are growing. Planned reserves of most

Business Trends (Continued)

commodities are more than 50% complete, but supplies of some key materials are reported to be too low for safety.

The pre-Korea stockpile program was hampered by lack of money and by the desire not to conflict with civilian demand. Now the government feels the situation is urgent, will build its reserves faster. Result will be a constant upward pressure on prices.

The U. S. is stockpiling natural rubber latex, taking 10% of all imports. That means synthetic rubber must be allocated. Users already have been ordered to cut back consumption of new rubber to last year's rate—a level one-quarter under the rate for mid-1950.

Synthetic-rubber production is being pushed, should hit a rate of 835,000 tons in early 1951. That will squeeze supplies of alcohol-butadiene. So the U. S. is reopening stand-by plants and buying alcohol abroad.

Woodpulp supplies are getting shorter. Imports, far above last year, still do not meet demand. Actual price is well above the published price.

Castor-oil supply is tight—though the U. S. has a good supply of most fats and oils. Many firms are allocating castor oil, some are refusing orders. The price of beans is way up. Copra and coconut oil also are in heavy demand. The U. S. gets three-quarters of Philippine output and could use more.

U. S. wool needs will be heavy in 1951—well above this year's 425-million pounds. U. S. produces only one-quarter of its requirements. The rest must be imported. This means a continued boom for the world's wool producers.

Synthetic substitutes threaten future wool sales. One new product, Orlon, is reputed to have all the qualities of fine wool. Continued high wool prices will speed development of synthetics, make them dangerous competitors. Wool supplies already are being stretched by mixing with other materials.

MORE GOODS FOR EXPORT will be freed by Korean victory. Domestic demand is falling off in lines where scarce buying created artifical shortages. Standard machinery, standard machine tools, and drugs should be easier to buy—until defense production gets going at full speed.

Goods that have been really scarce will stay that way. Supplies of steel, automobiles, appliances, and special equipment of all kinds will continue to be in short supply, even for domestic buyers. When export orders are accepted, they may be delayed by military production, which gets first place on production schedules and has top priority for scarce materials.

U. S. policy is to treat export demands fairly. Goods will still go to countries that need them badly—even when the goods are scarce in the U. S. But more and more products will be put under export controls.

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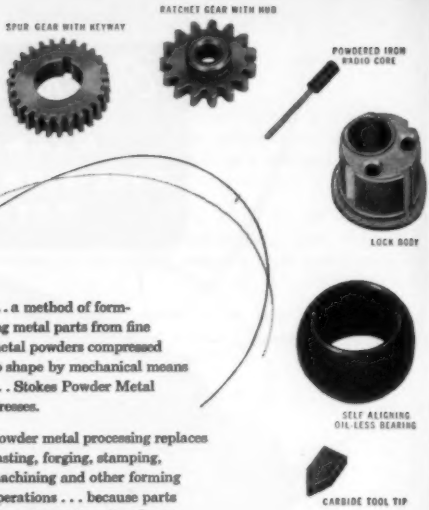

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Washington Report

WATCH JAPAN. For Japan is forging to the front as the one reliable big power ally of the U. S. in Asia—the much needed counterweight to Communist China.

U. S. thinking on Japan has changed radically in recent months. General MacArthur's original idea of making Japan an Asiatic "Switzerland" has long since been buried.

Washington officials make it clear that the Japanese will be allowed virtually a free hand to rearm and to trade where they like. Real progress, too, is finally being made on a Japanese peace treaty.

Washington plans to make Japan a big contributor in the development of Southeast Asia. Japanese businessmen are already receiving large orders to help rehabilitate Korea.

Japanese strength will be counted on to draw support away from Communist China—eventually to draw China out of the Russian colonial orbit. U. S. State Dept. would far rather see India in this role.

But Prime Minister Nehru's stock in Washington has dropped sharply since Korea. Nehru's indecision and his troubles at home have dashed hopes that he would provide the leadership the non-communist world needs in Asia.

SIGNS OF A LETDOWN after Korea have the administration really worried. The spectacular success of the operation has made war more remote than at any time in the past several years. That in turn makes it harder to get Congress and the people to take the hard steps that go with rearmament.

Administrative confusion adds to the threat. So far officials have not made a real estimate of the raw-material needs of rearmament. Also, Europe's share of military production is disputed at many levels. If Europe's needs are met first, it will definitely limit the rate at which U. S. forces can expand.

Answers to these questions are needed before businessmen can figure what cutbacks must be made in civilian production. Answers are needed before anybody can say definitely what manpower the armed services will require.

The arms race will go on, though. Russian provocation always seems to be strong enough and at the right time to jolt this country into action. The 1952 goal is a U. S. force of 3-million men, plus corresponding European units. Then Secretary Acheson believes it will be time to start talking about negotiating with the Russians again.

PRIORITIES FOR EXPORTS? It is just an idea, but keep it in mind. The administration, in order to get needed raw materials and to channel goods into important development projects abroad, may have to order manufacturers to

Washington Report (Continued)

produce for export. Raw-material producers the world over have been asking the State Dept. what the U. S. intends to let them spend their dollars on.

The implication is plain: If the U. S. wants to get the needed tin, rubber, wool, cocoa, and other raw materials at a reasonable price, the producers want to be sure they can use the dollars for what they need.

ECA investments in transportation and communications projects and in colonial development projects will be speeded up under the rearmament program. Airfields, harbors, telephone systems, and fleets of trucks and aircraft will get high priorities because they all have a big defense value. Colonial development projects are being pushed vigorously, particularly where strategic materials are involved.

POINT FOUR is going to be almost exclusively a government show. Planners had high hopes that private businesses through overseas investments would help out importantly. Private engineering firms were counted on to do much of the technical assistance work needed in the underdeveloped areas. But little hope is held out now for either case.

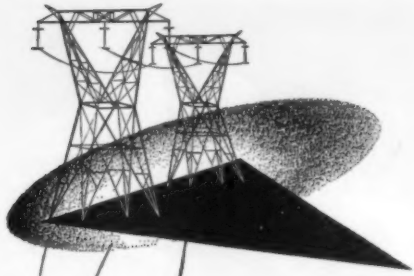
Export-Import Bank and the World Bank are taking over more and more of the dollar investment business overseas. Discounting oil and iron-ore investments, the two banks now do much more than half the business. And U. S. investors do not seem to mind a bit. Uncertain conditions plus profitable outlets for capital at home have virtually eliminated private investments as a significant factor in the economic development of most areas.

The administration's investment guarantee program is being quietly shelved (see McG-H Digest, May, p17). Congress crippled the program with unworkable amendments before letting it die in the Senate.

Business at best has been cool to the idea. ECA's guarantee program, a model for the administration's plan that was to have been administered by the Export-Import Bank, has failed badly. So far, ECA has guaranteed only 22 industrial investments totaling $22-million.

Developments in Iran are proving that private U. S. engineering firms are limited in their ability to plan a country's economic development. For a year now, Overseas Consultants, Inc., (a group of 11 top U. S. engineering outfits) has been advising Iran on development. But in October the State Dept. had to step in. The Iranians had failed to let the consulting firm go ahead on any of its planned projects. State now is sending U. S. technicians to Iran, which is financed by a $25-million Export-Import loan that is tied to specific projects.

State officials are now saying that basic development—roads, health, agriculture, education—are best handled by government technicians. Industrial technical assistance is the province of the private engineer.



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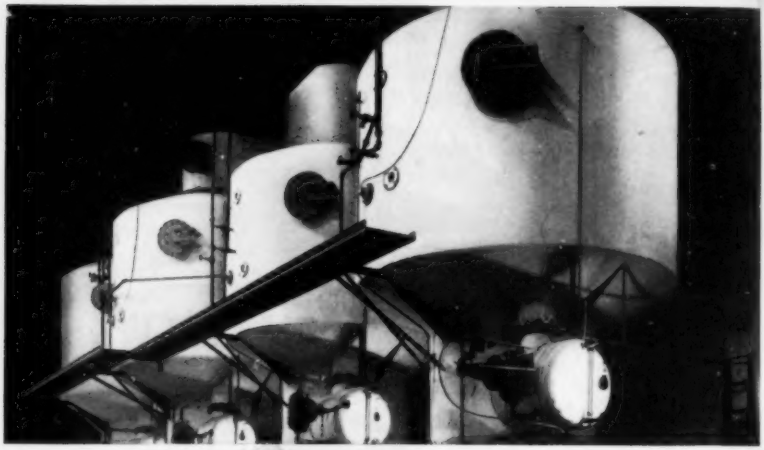


NO WASTE with — SWENSON* EVAPORATORS

The Swenson Long Tube Vertical Evaporator is particularly adaptable to concentration problems where no sealing is evidenced. This unit is "tailored" to fit the specific conditions under which it is to operate. The excellent results of this type on foamy liquor—and its ability to operate automatically without entrainment losses—are important features. It is extensively used on black liquor recovery in pulp mills and for heat-sensitive substances like glue and gelatine.

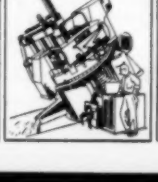
Also natural circulation evaporators — calandria, basket, and horizontal types. Write Whiting Corporation, 15696 Lathrop Ave., Harvey, Illinois. Export Department: 30 Church St., New York 7, N. Y. • USA Cable Code: "Whitinjack."

OTHER WHITING EQUIPMENT

EVAPORATORS

WHITING CORPORATION

* Reg. U. S. A. Pat. Off.

FOUNDRY EQUIPMENT	ELECTRIC FURNACES	LOCOMOTIVE JACKS AND HOISTS	CRANES	BUS WASHERS
				

December 1950 • McGraw-Hill DIGEST • Volume 5 Number 12

Clearing House for Patents

ECA's Small Business Section in Paris sets up clearing house to help U. S. and European businessmen license patents and processes

PARIS—Foreign trade is not only the shipment of goods between countries. It consists too of the sale of technical information and patent licenses. But both American and foreign businessmen face trouble in finding the right buyers and sellers.

ECA's Small Business Section here has set up a two-way clearing house to help in this job. It will:

- Enable European businessmen to get in touch with American firms anxious to license their products or to manufacture European goods under license.
- Help Europeans scale the U. S. tariff wall.
- Spur economic expansion on both sides of the Atlantic. Large-scale licensing could swell the available number of new products, create new consumer demand, and increase employment.

Here is how the clearing house will work: ECA will sound out interested American businessmen through its nation-wide web of field counselors. These field counselors, as a result of an ECA questionnaire, already have forwarded to ECA, Washington, nearly 150 detailed replies from U. S. manufacturers actively interested in licensing in Western Europe.

European Information Network

Meanwhile, ECA officials in Western Europe are establishing a similar information network to contact European businessmen. Banks, manufacturers' associations, and Chambers of Commerce form the main strands of this web.

Information from both sides of the Atlantic will be centralized by the Small Business Section. It will put interested American businessmen in touch with appropriate European businessmen. Then it will be up to the businessmen themselves to close the deal.

European businessmen, ECA officials report, are competing vigorously for licenses to American-styled products. The Scotch are leading so far. The Scottish Council has distributed brochures explaining the program and questionnaires to be filled out by manufacturers. It also has sponsored newspaper and radio campaigns.

Interest High in Italy

Banks and government have taken the lead in pushing the project in Italy. Interest is high because Italy's brimfull unemployment pool provides strong incentive for development of new industries.

The Irish Industrial Commission has made a good start on a similar program. So has the Federation of British Industries.

Banks and manufacturers' associations in Belgium and Holland have begun sounding out their businessmen. The Conseil National du Patronat Francais and the American Chamber of Commerce in France are doing the same.

German businessmen, so far, have showed more interest in the possibilities of licensing their products than of making American goods under license.

By the end of the year, ECA expects to have all Marshall Plan nations covered with an adequate information network, to have full-scale field-counselor organizations functioning, and to be deep in its job of switching licensing offers and demands in both directions across the Atlantic. The clearing house could well turn out to be one of the most useful permanent contributions of the Marshall Plan.

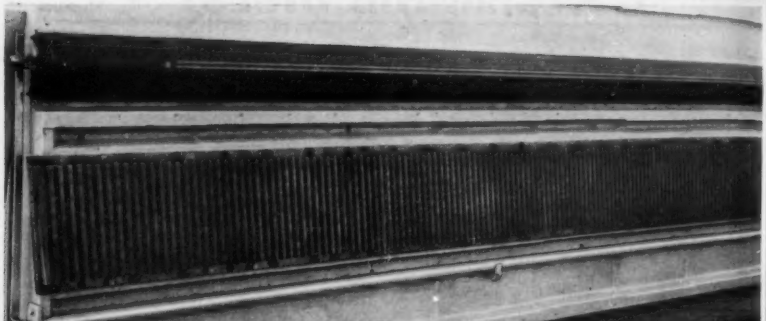


TABLE WAYS produced from phenolic laminated plastics reduce maintenance problems

Structural Plastics: A Review

Plastics when applied to load-bearing structures have the advantages of light weight and simple fabrication. New developments have extended their range. This discussion will help bring the engineer up to date

IMPROVED MATERIALS, plus better fabricating techniques, have resulted in an increasing employment of plastics in load-bearing structures. Lack of stiffness, toughness, ductility, and dimensional stability under varying environmental conditions have excluded otherwise suitable plastics from structural utilization. But recent developments indicate that this factor has already been minimized and that considerable improvement in these respects may be anticipated.

New materials, capable of being molded at very low pressures in inexpensive dies, have been developed. Better adhesives, suitable for bonding plastic to plastic, wood, or metal, are becoming available.

Here are some of the more recent developments in the industry.

Laminated Plastics—Laminates reinforced with various woven-glass fabrics are becoming more important. Although many standard forms of glass fibers are available, best properties in the laminate are achieved when continuous glass filaments are used in the woven fabric. Either glass warp and cotton fill or all glass fibers make up the fabric.

It is necessary in some cases to heat-

treat the glass fabric to ensure good adhesion of the resin and glass. When the proper resin is employed, good moisture and temperature properties can be obtained.

Another recent laminating development is the employment of Mitscherlich sulphite (spruce pulp) as the base for a paper laminate that yields a product with high strength and stiffness.

It is expected that the synthetic fibers (rayon, nylon, etc.) will be applied to laminates requiring special characteristics.

Low-Pressure Molding—Low tool or mold costs and the ability to produce relatively large parts are two of the advantages of this process. Parts made by low-pressure molding are stress-free and may consist of complex assemblies, some of which may be fragile.

Some of the products produced commercially by low-pressure molding techniques are: structural sandwich construction, boat shapes, modern curved furniture, and aircraft parts.

Common impregnating resins are phenol-formaldehyde resins, melamine-formaldehyde resins, and the polyester resins.

Reinforcing agents may be sheet metal, plywood, fiberboards, and high-pressure plastic laminates. Fabrics of all kinds, including glass-fiber cloth, papers of all kinds, and fiber mats, are also used.

Generally both the impregnating and adhesive resins are the same.

Sandwich Construction—This type of construction will provide stiffness, rigidity, smoothness, and/or lightness. Dense faces, separated and stabilized by a thick, light core, and the bonding medium make up a sandwich construction. Major applied loads are carried by the face material. The bonding medium effectively fixes the face to the core.

Wood and plywood are the most common core materials. Expanded plastics such as cellulose acetate, polyvinyl chloride, polystyrene, and the natural and synthetic rubbers are now finding applications for core materials. Other core materials contain fibrous fillers and are called "pulp-base" materials. These are composed of various proportions of resins and wood pulps or other cellulosic fillers.

Both tubular and hexagonal arrangements of relatively dense material have demonstrated fair efficiency as core materials. Metal-foil honeycomb will give the best structural properties. Other honeycomb materials are impregnated cotton fabric for toughness and machinability, resin-coated glass fabric for electrical properties, and resin-impregnated paper for lowest cost.

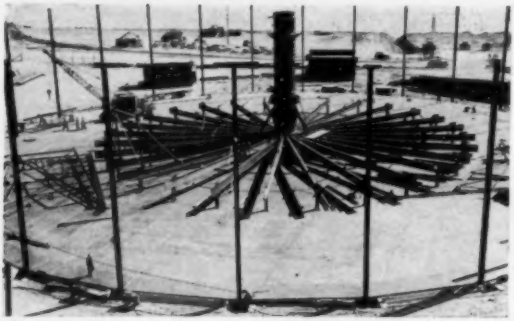
Metals are most frequently used for face material. Principal metals are aluminum-clad dural, stainless steel, zinc-coated steel, and magnesium alloys. Where electrical requirements prohibit the use of metal faces, these materials are the most common: glass-fiber cloth, cotton fabrics, high-strength paper, and synthetic fabrics. The most common synthetic resins for impregnating and laminating these fabrics are polyester resins, allyl-compound copolymers, and phenol-formaldehyde resins.

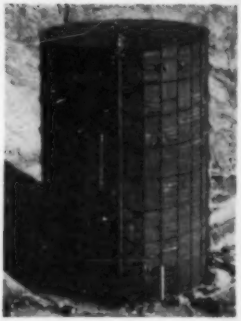
Structural Adhesives—New developments in bonding both metallic and nonmetallic materials by adhesives have greatly extended the range of application of industrial adhesives.

Some of the more important adhesive substances are rubber and rubber-like materials, polyvinyl compounds, cellulose derivatives, phenolic resins, nitrogen-containing organic resins, and polymerizing-thermosetting resins.

Metal adhesives usually have a rubber base. Temperature, water, and bacterial resistance are inherent in the phenolic adhesives. The nitrogen-containing organic resins, in general, should not be applied where high humidities are encountered.—*From "Structural Plastics", 301pp., illustrated, published by McGraw-Hill Book Co.*

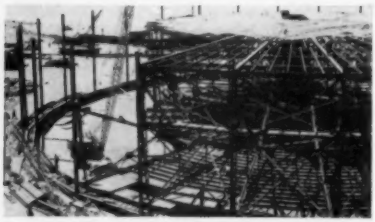
These Methods Built This . . . . . Gas Holder





PISTON IS ASSEMBLED *on gas-holder foundation. Bottom plate for piston is lap-welded of 1/4-in. steel plates, separated from concrete foundation by 1-in. sand leveling course.*

Air Floats Gas-Holder Roof



ROOF IS ERECTED *with top only 46 ft. from ground. Piston has been completed.*

STRUCTURE IS READY *for first 40-in. tier of shell plates. Roof and piston are tied.*

Building this tank from the roof up saved materials handling and kept high-level premium pay at a minimum

BUILT NEAR GROUND LEVEL, the roof of this tank was floated aloft by air pressure to act as a templet and working platform from which the holder's shell was built as the assembly rose.

Key unit of the completed and operating holder is the piston—a trussed steel disk of the full diameter, which rides on top of the gas and serves as a seal. The piston was also the key unit in constructing the tank.

First, the holder's concrete foundation was poured, and the piston assembled in place on it. Then the roof was built on top of the piston. Temporary structural links were installed to hold piston and roof together. I-beam columns were set at polygon corners, and the piston-roof assembly was held to these verticals by sliding yokes and clamps.

Next step was to erect and weld the tank's shell plates in 40-in. tiers. The piston was boosted to the top of a tier of

plates by air pressure and anchored there until the next tier was completed. As each successive tier was added, piston and roof were raised another 40 in.—Const Meth & Equip, Oct, p52

Traveling Stockrooms Assure Flexible Assembly

Where products are not too bulky, a system similar to the one at the Camera Works, Eastman Kodak Co., may help with your production and materials-handling problems.

Here are some of its advantages:

- Handling costs are cut.
- Space is saved.
- There is less scrap.
- System is flexible.
- Inventory is taken in 15 min.

This is how it works. Trays are loaded with parts and subassemblies in the stockroom and placed on the conveyor. The conveyor moves the trays from the stockroom to a worker at the bench. Here, the worker removes the tray. A complete circuit of the assembly area is made in this manner.

When the operator has finished with a tray of parts, she replaces the tray on the conveyor. As she works through one tray of parts, she withdraws another to hold in reserve.

The sequence of operations is not important. Workers are placed according to their best advantage.—Factory, Sept, p84

Rocket Motor Pint-Sized

Tiny liquid-fuel rocket motor, small enough to hold in one hand, is helping engineers at Massachusetts Institute of Technology develop fuels for full-size rocket-powered missiles.

The "microrocket" uses only 2 lb. of fuel in 1 min. A German V-2 would use 12 tons in that time.

The small rocket motor can use any liquid rocket fuel, but mostly has been operated with a combination of liquids that ignite spontaneously on contact. When they come together inside the motor, the resulting flame gives tremendous heat.

In 1-min. operation, the microrocket develops 300-psi. pressure, shoots gas out of nozzle at 5,000 mph., and produces heat at the same rate as does a furnace big enough to heat an eight-room house. —Prod Eng, Sept, p154

Plant Engineering Handbook

This handbook is written for those people in industry who are responsible for organization, design, construction, operation, and maintenance. It is intended to help solve the day-to-day problems of industry. This book presents in compact form material that appears in greater detail in specialized reference works. It is not intended to replace the usual type of engineering handbook; it is to supplement and extend.

The book deals with industry's consumption and conservation of basic resources, with management engineering, with industrial construction, fire protection, maintenance, with industrial power and its uses, with air handling, materials handling, and the handling of services. It deals with the more specialized subjects of instrumentation, bearings and lubrication, engineering materials, and mechanical power. It covers many other subjects vital to efficient industrial and institutional operations.

Plant Engineering Handbook (2,007 pp, illust., $15.00) is published by the McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 18, N. Y., U. S. A.

Pumped-Storage Gives Dam Low-Cost Peaking Capacity

One of the first pumped-storage installations in the U. S. to obtain peaking capacity is nearing completion at Buchanan Dam of the Lower Colorado River Authority.

A 13,450-hp. motor and centrifugal-pump unit, which operates on off-peak power supplied by steam units, pumps water from a lower reservoir to an upper reservoir 3 mi. upstream. Pumping for 30 hr. adds enough water to operate a 14,375-kva. turbogenerator for 20 hr. Two other turbogenerators operate on normal water supply.

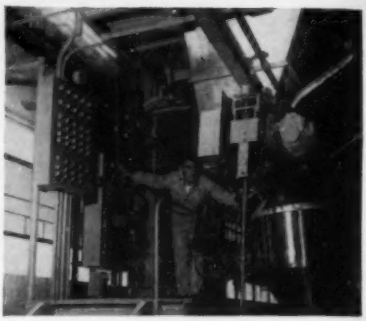
Water is pumped to the upper reservoir through a penstock that has a Y connection. One leg of Y goes to the pump, the other to the turbine. A motor-operated valve controls water flow in the pump leg of the Y. In case of power failure, the valve closes within 2 min. During hydro operation, it also isolates pump from penstock.

Total cost of the turbogenerator and pumped-storage installation is estimated to be $115 per kw. based on the generator output. Over-all efficiency is expected to better 70%.—Elec World, Sept 25, p87

Heat-Resistant-Alloy Data

Data now available on Therma-alloy 30, a heat-resistant 21% chromium and 9% nickel alloy, indicate exceptional ductility with good creep strength. The alloy, made by American Brake Shoe Co., can be given a tensile strength of 110,000 psi. at 35% elongation in 2 in. and a Brinell hardness of 210.

Applications include furnace parts, kiln alloy parts, and oil-refinery catalytic-unit castings. Foundry handling characteristics are comparable to those of the 25% chromium, 12% nickel alloy. Machinability, except for tapping, is satisfactory. Weldability is excellent.—Steel, Aug 21, p104



FAST FOOD

Proportioning and blending of Jello at General Food's new Calif. plant are speeded up by monorail cars. When operator presses pushbutton, ingredients are automatically measured into two stainless-steel containers inside conical car. Pressing another pushbutton sends car to blending line.—Food Ind, Sept, p63

Fiber Drum for Nails

Columbia Steel Co. cites these advantages of the fiber drum over the conventional wooden keg in the nail packaging operation: (1) it cuts packaging costs about 50% by reduction in hand labor; (2) it saves approximately 50% in container shipping weight; (3) it takes less warehouse space; (4) it is easier and safer to handle—does not break open when dropped, has no dangerous splinters or jutting nails. The drum carries the same 100-lb. weight of nails formerly packaged in the wooden keg.

Container board is seven-ply, made from 0.016 in. Fourdrinier kraft wound on a mandrel from 17½-in. wide, 2,000-lb. stock rolls and laminated with cold sodium silicate adhesive.

The steel top and bottom of the drum have corrugations around the rim, formed in the crimping process, that prevent slipping when the containers are stacked in palletizing and warehousing.—Mod Packaging, Sept, p126

Plastic Extrusion Covers Wooden Dowels, Slats

A process of extruding thermoplastics over wood has been developed by American Plastics Corp. The plastic-covered wood parts retain the strength and workability of wood and require no painting or other finishing.

They have been made with butyrate on cross-sections of 2⅛ in. or less. The plastic covering can vary from 0.004 to 0.030 in. in thickness as the application requires. It is also possible to cover pieces of variable cross-section.

Wood lacks dimensional uniformity because of changes in its moisture content. It was found necessary to predry and dehumidify the wood stock. Just before the wood enters the die, it passes through a ring of hot-air jets that remove any moisture and decrease the temperature differential between the wood and plastic.

The wood emerges from the die surrounded by a plastic tube that shrinks to the size of the wood as soon as it cools.—Mod Plastics, Sept, p84

Tilting Caster Pours Molds

Permanent-mold aluminum castings are produced by Ebaloy, Inc., with a minimum of rejects through the use of automatic, electronically controlled, gas-fired crucible casters.

A permanent mold is fastened to the top of a tilting crucible. When the crucible tilts, molten metal runs into the mold. Rate of flow is controlled by tilting speed.

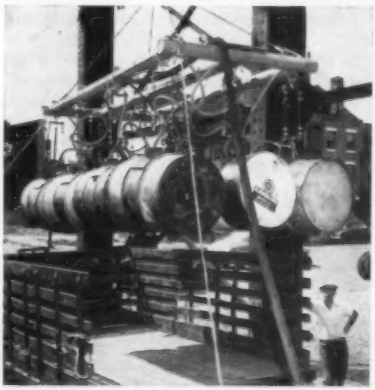
When the mold is full, tilting automatically stops and the crucible remains stationary to let the metal solidify. Holding time depends on casting size and its largest cross-section. The crucible then returns to normal position, the mold opens, and the operator removes the casting.

Bits of metal are blown from the mold by air jet, and the actuating button is pressed to begin another cycle. One operator can handle three or four casting machines making castings of 3 or 4 lb.—Foundry, Oct, p148

Speeds Battery Production

Four radiant infrared heaters in a conveyorized oven at the National Battery Co. flow the asphalt compound that seal the cells in storage batteries. The heaters replace a gas flame that burned battery tops and also failed to produce proper bonding between compound and case.

The infrared heaters give the required bond, increase production with fewer rejects, operate in high ambient temperatures permitting higher efficiency, and reduce fire hazard.—Elec World, Aug 28, p116



UNLOADS WITH SUCTION

Device is an adaptation of the suction lifter device used to move precast concrete sections on construction jobs. Essential parts are vacuum pump, hose lines, and suction holders. Holders are attached merely by contact, thus eliminating all ropes and slings. It is claimed that jeeps, airplanes, and other such loads can be as readily handled. Device was developed by K. P. Billner of Vacuum Concrete Co.—Eng News-Rec, Aug 24, p23

Refined Pear-Canning Waste Makes Excellent Syrup Base

Soluble pear canning waste, previously disposed of at considerable cost, is now purified, for use as a syrup base, at an Oregon cannery. The process, while still on pilot-plant scale, looks commercially possible.

Recovery of the sweet juice will save a considerable amount of refined sugar. Only enough sugar to bring syrups up to desired Brix would have to be added to the refined single-strength juice.

Process consists of milling pear waste, converting it to a calcium pectinate gel, and pressing. Resulting juice is deaerated, boiled, and treated with an ion-exchange resin, gelatin, and activated carbon to clarify it.

Conversion of milled pear waste to gel is done to separate soluble from insoluble solids. It is accomplished by a lime gelatin process. De-esterification of the pectin is brought about by action of natural enzymes within a 4.5-9.5 pH range.—Food Ind, Sept, p82

Drag Chain Not Needed

The drag chain bouncing along under gasoline trucks has been officially amputated by the National Fire Protection Association. The association now claims that the drag chain is not sufficiently reliable as a ground for static electricity, especially over bituminous macadam roads or dry concrete.

Recommended is a more positive bonding and grounding arrangement while loading or unloading a tank truck. Such a device, known as a bonding cable, provides a metallic bond between truck and charging or discharging pipe.

It is not used when discharging to underground tanks because the hose nozzle in contact with the fill opening serves the same purpose.—Oil & Gas J, Aug 31, p39

Cold-Extrudes Steel Shells

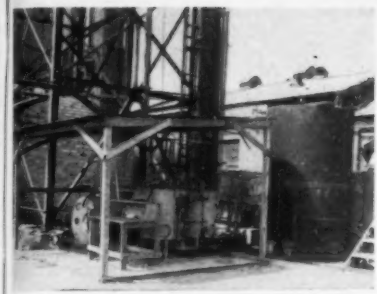
Concentrating pressures as high as 100 tons per sq. in. on a steel billet in special dies causes the steel to flow in a cold state around a mandrel. In this operation in a Lake Erie press at Mullins Mfg. Co., the steel assumes first the shape of a shallow cup and finally that of a finished artillery shell.

Initial work with this cold-extrusion process will include a pilot lot of projectiles for 105-mm. howitzers and for aircraft. These are believed to be considerably larger than the pieces cold-extruded in Germany where the process originated.

Engineers hope that the pilot work will show only 40,000 tons of scrap for production of 100-million shells. Comparable scrap for the method employed during World War II was 1-million tons.—Steel, Sept. 25, p80.

LOW-WATER COOLING TOWER

Gridwork of electro-tin-plated bronze-wire screens in Larkin Coil Co.'s new cooling tower gives adequate cooling with low-water consumption. Water is sprayed onto screens. Fans pull air in from bottom and across both sides of screens to evaporate and cool water. — Prod Eng, Sept, p103



PILOT PLANT at Armco Steel Corp. is for study of removal of phenols from coke-oven waste.

TONNAGE OZONATORS are installed in multi-unit banks; only end plates show.

Ozone for Chemical Processing

Tonnage ozone is a potential money maker in the chemical processing industries as a replacement for more expensive chemical oxidants

TREMENDOUS PROGRESS has been made in the last few years in the development of ozone (O_3) as an oxidizing agent. Processing advances have lowered its cost so that now it is highly competitive with many of the more common chemical oxidants.

In the manufacture of tonnage ozone, air is cleaned by electrostatic precipitator and paper filter, compressed to 10 psig. to condense moisture, dried by passage over activated alumina, then fed to banks of ozonator tubes. In the ozonator, the air is subjected to a silent electrical discharge. Oxygen can be used instead of air.

The ozone is produced as a gas, diluted with a large amount of air or oxygen. The ozonators made by Welsbach Corp. make ozone from air at optimum efficiency at a concentration of 1% by weight and from oxygen at 2%. Higher concentrations (5–6%) are possible, but only at a sacrifice in efficiency and output.

Oxygen feed is often preferred in large ozone plants where it is practical to recycle oxygen or where ozone-stripped oxygen can be used in other processes. Chief advantage is that power requirements are the same for making 2 lb. of ozone from oxygen as 1 lb. from air.

Ozone must be made where it is to be used as it is diluted with such large amounts of air or oxygen and is inherently unstable.

Under favorable conditions, quantity ozone can be made for 10¢ per lb. Under unfavorable conditions, cost may run to 50¢ or more.

Ozone can economically displace more expensive chemicals in many oxidation reactions. It has the advantages too of ease in control and handling and of freedom from residual salts and precipitates. Here are typical uses:

Water Purification—Among its spectacular applications is the world's largest ozone plant for removal of tastes, odors, and manganese from Philadelphia water.

Waste Oxidation—A pilot-plant setup at Armco Steel Corp. is oxidizing phenol in coke-oven waste. This removes phenol

at an economically justifiable cost. No objectionable reaction products are formed.

Pulp Bleaching—Laboratory tests indicate that ozone can be substituted for hypochlorite in bleaching sulphate and sulphite pulps. Advantages: higher brightnesses and more "level" color.

Textile Bleaching—The Stabilimenti Tessili Italiani Co., Italy, is bleaching cotton with ozone. Advantages: excellent and uniform bleach, no weakening of fibers, no tendency for yarn to yellow on aging.

Catalytic Agent—Pilot-plant work in Germany used ozone as a catalyst in the air oxidation of methane to formaldehyde.

Organic Reactions—Ozonization reaction, in which ozone reacts with unsaturated hydrocarbon, has been used commercially for making: anisic aldehyde from anethole, piperonal from isosafrole, vanillin from isoeugenol, acetoxy-bisnorcholenic acid from stigmasterol. This field is promising. A whole series of chemicals of potential value as solvents and intermediates may be synthesized from ozonization of fatty acids and petroleum hydrocarbons.—Chem Ind, Sept, p386

Aids Free-Fall Salvage

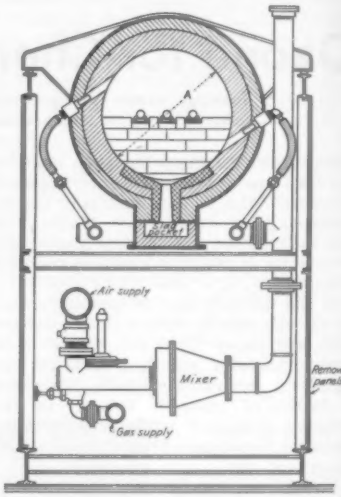
A new system for salvaging intact free-falling bodies and their related equipment used in high-speed aerodynamic studies promises to cut research costs considerably.

A dive brake and a self-contained parachute, developed by the U. S. National Advisory Committee for Aeronautics, permits undamaged recovery of models after a free-fall from an airplane at altitudes of 35,000-40,000 ft.

Dive brakes, located near the rear of the body, open at a predetermined speed. They have the form of a rugged "umbrella" with strong, metal ribs bolted to the fabric. When the body is sufficiently slowed, a 36-ft., ribbon-type parachute stowed in the tail is automatically released. The parachute eases the body to the ground in a vertical position.—Aviation Wk, Oct 2, p25

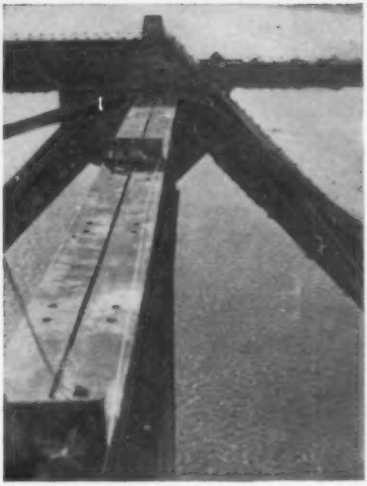
Molded Squeeze Bottles

The first polyethylene squeeze bottles were made by blow-molding. Now, bottles are produced by injection molding techniques in two principal parts. They are the main body section and the circular base, designed with a groove to fit the side wall. Base and body of the squeeze bottle are welded into a one-piece unit.—Mod Plastics, Sept, p88



HEATS BILLETS FASTER

Barrel-shaped radiant heating furnace, made by Surface Combustion Co. for Ford Motor Co.'s Canton forge plant, delivers 23-lb. scale-free billets at rapid heating rate. Capacity is 340 billets per hr. Skid rails are water-cooled pipe. Gas-air mixture is delivered tangentially, thereby heating refractory walls which then radiate heat. Furnace is pusher-type, 24 ft. long with barrel O.D. of 6 ft.—Iron Age, Sept 21, p100



BRINGS BACK BENT BRIDGE BEAMS

Heat from fire can twist bridges pretty badly (left). Fire at the Snake River Bridge, Wash., burned away timber deck and warped floor beams and struts. Joseph Holt of Seattle brought the bridge back to shape by "distortion control." Several beams are worked on at one time, with heat applied in V-shaped patterns to each beam in turn. Heating is started at V apex, and torch is weaved in ever broader strokes as it progresses toward mouth of V. Cold metal forces hot metal to upset. Beam (right) straightened out from 16½-in. misalignment.—Weld Eng, Oct, p50

New Cold-Reducing Process Makes Precision Tubing

Dimensional inaccuracies, inherent in hot-finished tubing, frequently compel the designer to specify cold-drawn tubing. But a more economical solution is to cold-reduce hot-finished tubing. Accuracy is excellent.

Tube Reducing Corp's Rockrite process of cold-reducing tubing consists of passing the tubing between a pair of curved oscillating dies. The tubing, which is on a tapered mandrel, is indexed one-sixth of a turn at each stroke.

Amount of reduction varies with steel composition and original stock size, but may run 40-80% of cross-sectional area in a single pass. For greater reduction, an anneal is usually necessary.

For example, 2¼-in. O.D. tubing with ⅝-in. wall can be reduced to 1.384-in. dia. with 0.224-in. wall at 90 strokes per min. and 0.220-in. feed per stroke. O.D. is cooled with soluble oil, while I.D. is lubricated with a mica lubricant fed through the hollow mandrel.

Additional advantage of the process is the improvement in physical properties. SAE 52100 steel in spheroidized and annealed state runs 187-207 Brinnell hardness and 80,000-psi. yield strength. After reduction, these properties are 265-300 Bhn. and 160,000-psi. yield.—Am Mach, Oct 2, p92

Rubber-Die Process Makes Small Short-Run Parts

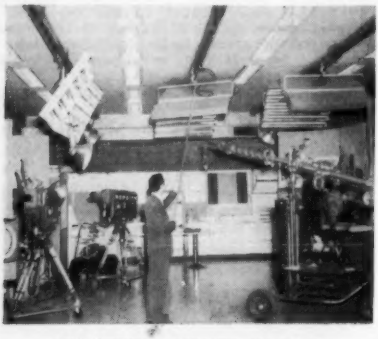
Rubber dies are drawing electron-tube development parts for Radio Corp. of America from harder materials such as Kovar, molybdenum, stainless steel, and non-metallic materials.

It is the same process so widely used in aircraft plants on aluminum alloys. Parts are blanked or drawn by pressing them into a contained rubber pad by a templet serving as a punch.

At RCA, the ratio of templet thickness to material thickness was found to be important for small parts. An optimum templet thickness exists for each job. If the templet is thicker, a rough jagged blank results. If it is thinner, more pressure is needed. For example, the ratio for material thicknesses of 0.008-0.010 in. is 10 to 1.

Shallow draws, pierced parts, and blanks can all be made in one operation. Tooling costs are small. Average cost of templets is about 1/10 to 1/15 that of conventional hand-fed blanking dies.

The process is relatively slow. But up to 2,500 parts can be made before it becomes more economical to employ conventional dies. If the press is large enough and templets make several parts at once, this number is greatly increased. —Am Mach, Aug 21, p102



TV STUDIO LIGHTS MOBILE

Cincinnati's television station WCPO has suspended trolley busway from the ceiling to get complete flexibility of lighting arrangements. It does away with extension cords and cables. Each light has universal joint and is moved and adjusted with hookstick from the floor.—Elec World, Sept 25, p130

Cheap Pipe-Break Repair

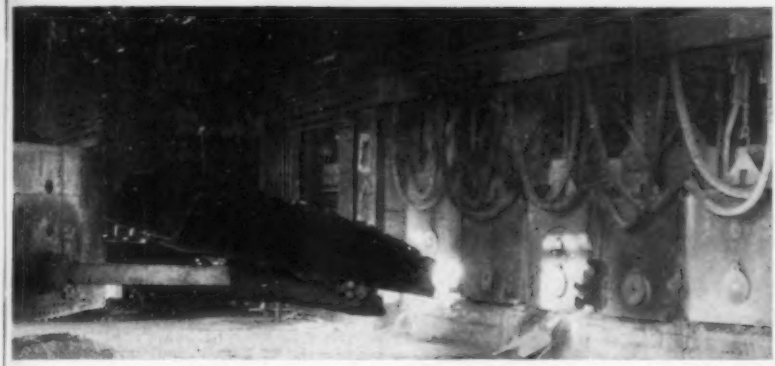
When a concrete settling tank at a sewage-treatment plant was emptied recently, ground-water hydrostatic pressure raised the tank enough to break inflow and sludge draw-off lines where they joined the tank-bottom concrete.

Earth underlying the tanks is clay. Pipe trenches had been backfilled with sand, which contained normal voids. Seeking a pipe repair that would not fail when the tank was refilled, engineers decided to surround the breaks with impervious material. This they did by injecting water glass and calcium chloride solution. When the two injections met in the sand voids, a gel was formed. This gel hardened, to produce the seal and repair the break.—Eng News-Rec, Sept 7, p54

Unusual Army Transfer Case

U. S. Army Ordnance specified maximum ease of shifting in both ratios of the two-speed transfer case together with automatic declutching for the operation of the front axle. The transfer case of the Reo 2½-ton 6x6 military truck meets both these requirements.

By means of an overrunning clutch, no torque is transmitted to the front axle until the rear wheels slip. The vehicle operates as a 6x4 under all ordinary conditions on the highway. When the front axle must drive on bad roads, engagement is made automatically without any help from the driver. Under maximum torque conditions, the torque is properly divided among the three driving axles.—Auto Ind, Sept 1, p32



NEW JAPANESE OPENHEARTH, shown being charged, has five water-cooled magnesia-lined doors that permit extremely rapid charging of large, heavy pieces of unprepared scrap

Unique Openhearth Furnace

Openhearth furnace that eliminates front wall, arches, and buckstays has charging, maintenance, productivity, and heat-balance advantages

NEW OPENHEARTH FURNACE, developed in Japan, has distinct advantages over the conventional type. Two objectives were in mind for the design; (1) faster charging and (2) longer roof life.

The furnace has a suspended roof and an all-door front, thereby eliminating door jambs and arches in the front furnace wall. It has no front buckstays.

Here are the advantages of this construction:

- Uniform, rapid charging.
- On oversize scrap, 5-10% of ingot cost has been saved through less scrap preparation.
- Rapid bottom repairs.
- No repair time on front wall.
- Scrap is closely packed longitudinally so that it heats and melts fast.
- Roof can be repaired partially during operation.
- Furnace productivity is increased at least 20%.

The new furnace has been in use at the Amagasaki Steel Mfg. Co. since January 1949. The fast charging rate that is possible permits maximum benefits to be gained from use of oxygen for reducing melting time.

The furnace, an 80-ton unit, has a suspended roof. The frame across the front is made of heavy girders, riveted and water-cooled.

Each brick in the silica-brick roof is independently suspended in the arch between the back and front water-cooled skewback. To allow for irregular roof expansion, the front skewback is supported by two structural steel arms placed between the main supports.

All five water-cooled doors can be opened to allow almost unlimited speed in charging. Unprepared scrap of the largest sizes can be charged rapidly. A new type of charging machine that has been specially developed charges scrap pieces sideways over a false bottom.

Cooling methods have been given close

attention. About 750 gpm. of water are used. A heat-balance study showed that the radiation loss is less than that of conventional openhearth furnaces because the entire front consists of water-cooled doors. This also provides better working conditions for the melter.

Tests have shown that production costs are less. For a gross ton, total costs run to 9,879 yen, or $27.38, as compared to 12,856 yen, or $35.72, for a conventional openhearth.—Iron Age, Sept 21, p85

Makeup-Water Demineralizer Expected to Cut Water Costs

First complete demineralizing plant to treat boiler makeup water in a central station has been put into operation at the Waukegan Station of the Public Service Co. of Northern Illinois. Its replacement of evaporators on the boiler-turbine units is expected to give these advantages:

1. Adequate makeup supply at all times.
2. Improved makeup quality—more uniform and free of carbon dioxide.
3. Reduced operating cost because of efficiency gains.
4. Reduced maintenance cost because of less non-condensable gases.
5. Reduced labor cost because new plant is nearly automatic.

Equipment consists of a duplicate set of cation-, anion-, and silica-removing units with one aerating tower for removal of carbon dioxide. Each set is rated at 120,000 lb. per hr. The 10,000-gal. storage tanks for concentrated sulphuric acid and 50% caustic soda solution are located adjacent to a railroad.

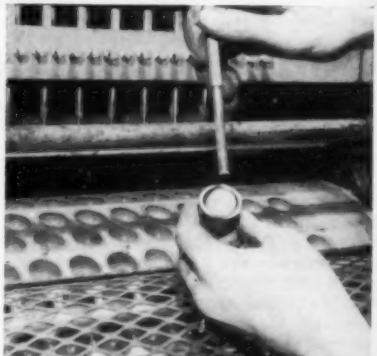
Each cation exchanger contains 125 lb. of sulphonated coal supported on a 13-in. bed of graded anthracite. Each anion exchanger contains 100 cu. ft. of resin on a similar anthracite bed. Silica absorbers also contain resin.

Total plant cost was $170,000. Chemical operating cost is 3.75-4¢ per 1,000 gal. of water.—Power, Oct, p88

Spray-Cool Diesel Radiator

Diesel-electric locomotives sometimes overheat in tunnels. So the Denver & Rio Grande Western Railroad installed a water spray device on the radiators of locomotive units. When cooling is needed, water is forced from a tank by main-reservoir air pressure to three vertically mounted spray nozzles below each radiator bank.

A solenoid valve is opened automatically when the engine temperature reaches a critical value. A loop from the engine-jacket water heats the cooling water. Hot water has been found more effective in cooling than cold, since it evaporates quickly on the radiator.—Railway Age, Sept 30, p26



RUBBER-CUP CHERRY PITTER

Small, clean holes and less waste (down from 18% to 9%) are advantages claimed for this Dunkley Co. cherry pitter. Pitting unit is bank of needles and rotating cylinder with 700 rubber cups. Cherries enter on conveyor belt, fall into cups, and are pitted by needles. The rubber cushions the shock, avoids tearing of fruit. Capacity is 1,000 lb. per hr.—Food Ind, Oct, p93

New and Exciting Ideas for the Ceramic Industry

Cutting costs, boosting production, and improving quality are everlasting challenges to executives in the ceramic industry. Here are some ideas to help them:

▶ Molten frit is quenched by water-cooled rolls. Process, developed by O. Hommel Co., flows frit through furnace orifice, drops it through hole in refractory channel, and rolls it to a thin sheet.

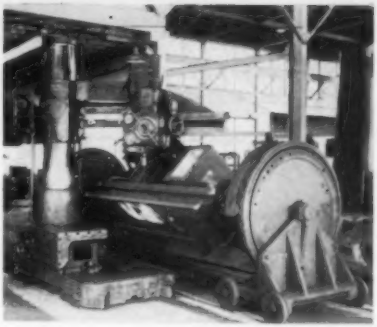
▶ New glass-house quicklime, known as Kemidol Oxide-Fluxing-Ground and made by U. S. Gypsum Co., is now on the market. Its relative freeness of fines facilitates unloading from cars and keeps down dust. Unloading takes only one-half the usual time.

▶ Oval decorating kiln can be loaded and unloaded by one man without stopping the conveyor. One-half of conveyor is outside the kiln, giving a long accessible area. Heating is by 12 radiant tubes, six on each side. Top temperature is 1500° F. Kiln is built by Toledo Engrg. Co.

▶ New decals for pottery and glass decoration consist of enamels printed on a collodion film, which is attached by a water-soluble gum to a backing paper for support. Unskilled operators can handle the decals. Made by Johnson, Matthey & Co., Ltd., London, the decals are ideal for permanent labels on glass containers because the enamels are resistant to all detergents.—Ceramic Ind, Oct, p54, 55, 61, 65

Balances Car Wheels

Maintenance costs were reduced 50% when armatures, other generator parts, and air-conditioning equipment were dynamically balanced regularly at the Illinois Central Railroad. Now the railroad balances car wheels. The average unbalance was found to be 2½-3 lb. per wheel. A considerable reduction in vibration is achieved.—Railway Age, Sept 23, p44



TURN-OVER FIXTURE FOR DRILLING

Familiar sight in welding shops, but unusual in machine shops, this motor-driven turn-over fixture is large enough to handle a complete machine bed. All holes can be drilled and tapped at any desired angle by means of index pins engaging the fixture and plates. Mounting rails are machined flat and true so machine will be level.—Factory, Oct, p126

Study Points to Best Paint

Three years of paint exposure tests, conducted by Dow Chemical Co. and Sherwin-Williams Co., have yielded specific conclusions about specific materials.

Of eleven primers tested, the one found to be best contained 55% red lead in the pigment with the balance being about equal parts of zinc chromate, zinc oxide, iron oxide, magnesium silicate, and diatomaceous silica. The liquid was a fast drying synthetic varnish. Primer dried for recoat in 6-8 hr.

Of the nine finish coats tested, the one found to be best had a vehicle of medium oil butyl-phenolic resin varnish with different pigments. Loss of gloss with all the finishes was rapid in severe areas, falling to egg-shell in 3 months and flat in 6 months. Chalking occurred at various times. The phenolics, which rated low in appearance at the beginning, were given top rating after 16 months.—Chem Eng, Oct, p110

Papermaking Ideas from Abroad

Sodium peroxide bleaching of groundwood, building boards, avoiding press sticking, and reburning lime sludge are examples of good practice overseas

THE WHOLE WORLD makes and uses paper. Here are some ideas that come from Europe, Asia, and Australia.

Bleach Groundwood—Spruce groundwood was experimentally bleached in Germany with a solution of 20 grams sodium peroxide, 50 grams sodium silicate, and 17 grams sulphuric acid per liter, followed by treatment with 1% sodium bisulphite.

Bleaching at 15% stock consistency with 2% peroxide at varying temperatures showed optimum brightness at 40°C. Optimum increase in brightness (from an initial 55.8% up to 71.3%) was gained in 5 hr. with 5% peroxide. Longer bleaching periods acted adversely.

When bleached pulps were irradiated with a quartz lamp, they showed a greater percentage of loss in brightness than did the unbleached pulps.

Building Boards—From India come reports of a study on building boards made from wood shavings and sawdust with suitable binders. Following types were prepared: wood wool-cement (and wood wool-protein) boards; hard boards with sawdust treated with protein binders; and boards with sawdust and formaldehyde resins.

Best results were obtained with "ground-nut protein-formaldehyde" and phenol-formaldehyde resins.

Press Sticking—When processing eucalypt wood in an Australian plant, it was often necessary to overcook the wood to avoid adhesion at the press. Sticking was also alleviated by adding a sodium carbonate solution to the pond before the doctor, but the procedure had many disadvantages.

Experiments showed that sodium hexametaphosphate was far more effective than sodium carbonate. Other substances that prevented sticking were caustic soda, phosphoric acid, sodium phosphate, sodium fluoride, and sodium silicate.

Sheet sticking is caused by: Bakelite, steel, or bronze scrapers held on the roll, papermakers' alum, aluminum chloride, ferric chloride, glue, starch, and sodium sulphide.

Continuous addition of 2 lb. per day of sodium hexametaphosphate (Calgon) to the press roll pond prevents sticking entirely. It also permits use of hard pulps that otherwise could not be handled on the paper machines.

Lime Sludge—At Karlsborgsverken, Sweden, a plant reburns lime sludge in a rotary kiln. The kiln is heated by producer gas from wood waste, which is dried in a rotary dryer heated by waste gases from the kiln.

The reburnt lime contains 78-80% cal-

MOBILE PARTS RACK IS HANDY

Emphasizing ease of selection, this mobile parts rack is one of a battery of new, time-saving units supplying Boeing Airplane Co.'s final-assembly area. Overcoming disadvantages of old, slow method of wrapping parts, placing in bags, transporting to shops, unwrapping and redistributing in racks and bins, new carts with parts in plain view are wheeled directly to working station.—Aviation Wk, Sept 4, p23

cium oxide and 6-8% calcium carbonate. Reburning is comparatively cheap. Lime can be produced from the sludge at 41 Swedish crowns per ton of lime, whereas lime from limestone costs 78 crowns.

Heat losses in the system are relatively high. About 31% goes to drying the sludge, 22% for burning, 8% is lost with the lime, 15% is lost by radiation, 10% is used in drying the wood (fuel), and 14% is lost in the gas from the dryer.—Paper Ind, Sept, p645

New York's "Safest Inch"

New York City's densely populated areas dictated extraordinary anti-failure precautions in design of a natural-gas pipeline. Here are some of the features of the design and construction.

Allowable stress used is about half that allowed by the American Society of Testing Materials standard. The main was covered with a vented casing wherever it crossed over a rapid-transit subway structure. Special expansion joints were designed and built for two bridge crossings.

Automatic valves were believed to be not practicable. Manually controlled valves will be used in the streets. Shutoff valves are specified for strategic locations.

Submerged river crossings will be made with extra-heavy pipe protected with a waterproof coating—Eng News-Rec, Sept 14, p41

Examines Pots and Pans

Ultraviolet light can show up otherwise invisible food particles and other sources of contamination on dishes, cooking utensils, and other kitchen equipment. New York City Dept. of Health is experimenting to determine its effectiveness in restaurant inspections. "Black light" lamps are mercury-vapor units and require special auxiliary apparatus.—Elec Whols, Sept, p121

HOW TO TRAIN YOUR CRANEMEN

A miniature crane helps train crane operators at Armco Steel Corp. Scaled to 1/16 in. per ft., model operates exactly the same as full-sized crane. Training period of 80 hr. includes essentials of crane maintenance as well as handling of loads. Safety is stressed strongly.—Am Mach, Sept 18, p103

Brazes Stainless Steel for High-Temperature Service

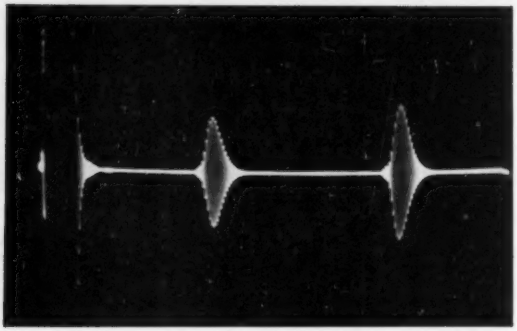
Brazing of high-chromium stainless steel is being done successfully by Wright Aeronautical Corp. No flux is needed because brazing is done in an atmosphere of dry hydrogen.

This hydrogen has a dewpoint of —40° F. Ordinary commercial furnaces cannot maintain such a low dewpoint so a double-ended electric furnace with water-cooled antechambers must be used. The dry hydrogen is prepared from bottled hydrogen by passing it through a palladium catalyst tower and an activated alumina drying column.

Copper is not suitable as the brazing alloy. Instead a powder form of a hard facing alloy with a nickel-chromium base has been found to flow and braze well. Commercial form is Colmonoy No. 6, made by Wall-Colmonoy Co.

As solution of the alloy with stainless steel is rapid, the highest possible brazing temperature is recommended to obtain complete joint coverage. Joints are giving satisfactory service up to 2000° F. —Iron Age, Sept 28, p74; Oct 5, p84

Oscilloscope Pattern Shows . . .



. . . how high-frequency sound is reflected by defect. Initial impulse (left) is reflection from contact surface. End of piece reflects sound, causing an end pulse (right). Pip in between is caused by defect and shows its location.

Hidden Flaw . . .

. . . in a 6-in. high-temperature, high-pressure alloy pipe is 30 in. long.—Power, Oct, p102

How to Cut Machining Costs with the Right Coolant

Coolant selection can affect machining costs as much as can cutting-tool selection. Dramatic evidence of this was furnished by a study made at Salisbury Axle Works on a Gleason Revacycle gear-cutting machine. Change of coolant alone cut the cost per piece by 48% because of increased tool life.

Tests were made by using two machines and alternating water-soluble and oil coolants. Results were judged by grinding needed to resharpen the cutters. Sixteen different coolants were tested.

Recommendations made as a result of the tests were (1) to use a coolant of 5% lard oil and 95% paraffin oil, (2) to run 3,000 pieces per grind, and (3) not to try to clean up one bad tooth when grinding if only one in any one segment is peeled more than the others.

Performance observations made since the investigation showed these tool costs: For sulphurized cutting oils and water-soluble coolants, tool cost per gear was $0.0212 with 13,760 gears cut per cutter. For the mineral-lard oil, cost was $0.0110 with 27,329 gears per cutter.—Am Mach, Sept 18, p109

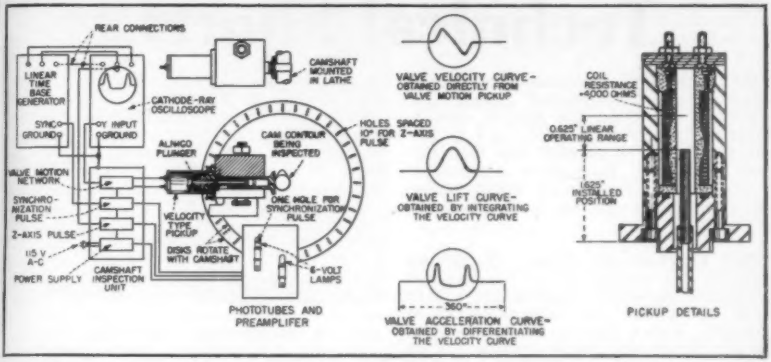
Diverse Markets Open Up for Liquefied Petroleum Gas

New markets for liquefied petroleum gas (LPG) are developing so fast that even the manufacturers are having trouble keeping up to date. New one with biggest potential is use of propane and butane for tractor, truck and bus engines.

Unofficial estimate is that 100,000 farm tractors were converted to LPG last summer. Most changeovers are made with conversion kits.

A kit made by Baker Flash-O-Trac Co. circulates hot water from tractor's radiator through a heat exchanger in the fuel tank. Heat vaporizes the propane, which is then drawn into the carburetor. The venturi also is changed.

Several cities are experimenting with



***ENGINE CAMS** are checked by this permanent-magnet pickup fixture plus cathode-ray oscilloscope, which gives curves corresponding to velocity, valve lift, and valve acceleration in . . .*

LPG buses. Chicago has just ordered 500, which will create a demand for 6-million gal. of propane a year.

Private cars also can be converted to LPG. Reason: 16 or 17¢ per gal. as against 23-28¢ for gasoline.

LPG is going flying too. An airplane fueled with propane is making test flights. Other markets are for cigaret lighters and household garbage incinerators.—Oil & Gas J, Sept 14, p69

Roll Picker Finds New Use

When roving and spinning frames are cleaned and overhauled, the rolls, stands, clearers, and other parts have to be cleaned by hand. The cleaning job is slow and tedious, and it is hard to get metallic rolls clean.

The mechanical roll picker will do a cleaner and faster job. Brushes suitable for the different cleaning tasks are welded to short steel shafts that fit in the tool end of the air-operated picker. When cleaning is to be done, the necessary brush is placed in the roll cleaner and used as the regular roll brush is used.—Textile World, Sept, p158

Electronic Inspection of Camshaft-Lobe Contours

Good performance of internal-combustion engines depends to a large extent on the accuracy to which camshaft lobes are ground. Conventional inspection methods record the cam contour lift at intervals of 1 or 2°, but do not give results as accurately or as quickly as does electronic checking.

In the latter method, the camshaft is mounted in a lathe and rotated at 200-400 rpm. A tappet follower contacts the cam lobe. Attached to the follower is a small Alnico magnet moving inside pickup.

As the cam turns, the Alnico plunger reciprocates and generates a voltage across the pickup terminals. The voltage is proportional to the velocity curve when terminals are connected directly to the cathode-ray tube.

A rotating disk triggers light to two phototubes for photographic purposes. Two sets of holes are for synchronization and calibration. A selector switch gives the curve desired on the oscilloscope. Testing each lobe takes about 1 min.—Electronics, Oct, p75

Technical Shorts

Train Auxiliary Operators — Enlarged photos show Consolidated Edison Co. equipment in actual use and in various stages of disassembly. Photos are spiral-bound, mounted on an easel that folds flat when not in use. Each photo is protected by an acetate covering on which grease pencil markings can be made.—Factory, Oct, p228

Midget Crackers—An Italian oil refining company has ordered two of the smallest Thermofor catalytic cracking units ever made. They will have daily capacities of 1,630 bbl. Foster Wheeler Corp. is designing and supervising construction at Genoa and Rome refineries.—Oil & Gas J, Sept 21, p182

Heated Coal-hopper Discharge—By steam-heating and insulating only the outlet tip of hopper, the Stauffer Chemical Co. keeps coal flowing to boiler furnaces in sub-zero weather. Maximum heat at the hopper tip is attained by encasing the steam heating coil in a mineral-wool blanket.—Coal Age, Oct, p104

CUTS, CRIMPS, AND ROLLS

Insulating paper, bought in 36-in. rolls by Dowzer Electric Machinery Works, Inc., is cut to requirements, such as to 4½-in. width for 3¾-in. crimp. Paper is cut by adjustable, heavily weighted cutting arm that presses cutting wheel into paper being pulled off roll. Paper is fed up to crimping table where it is creased, crimped, and rewound into rolls. —Elec C&M, Sept, p117

Substation Noise—Pacific Power & Light Co., because of complaints about transformer hum from a substation in a residential neighborhood, built a walled enclosure of sand-filled pumice bricks to serve as a noise barrier. Special baffle walls were built inside at ventilation openings. Ceiling wood blocks were installed for Fiberglas panels if they are found necessary.—Elec West, Sept, p77

Seed-germination Tests—U. S. Dept. of Agriculture scientists are experimenting on effect of high-frequency sound radiation on germination, flowering, growth, and yield of hybrid corn. Faster germination is expected, but also possible is failure of some seeds to take root.—Electronics, Oct, p238

Better Potato Chips—Longer shelf life for potato chips is promised by development of a stabilized refined corn oil by A. E. Staley Mfg. Co. New oil is stabilized with an anti-oxidant that retains effectiveness even under extreme heat. It should find use in all fried foods where oxidation rancidity is a problem.—Food Ind, Oct, p55

Synthetic Lubricant—Pressure-lubricated valves on 20 air compressors in a Celanese Corp. of America plant are lubricated with a silicone grease. Purpose is to reduce maintenance and frequency of greasing.—Power, Sept. p116

Competition—Fresh orange juice is now being sold from coin-operated machines that mix an orange drink by adding the required amount of water to frozen concentrate. Machines in some locations are collecting more nickels than nearby Coca-Cola machines.— Am Business, Sept, p5

"Brain's" Double Job—An "electronic brain" at Consolidated Vultee Aircraft Corp. is capable of performing 600 equations an hour. Unusual application of the brain is to compute the paycheck figure for employees. Payroll operation now takes less than half the time formerly required.—Aviation Wk, Oct 9, p41

HUGE BALL CLEARS FOREST

A 4½-ton hollow steel ball, 8 ft. in dia., helps to clear the forest at the Hungry Horse Dam. The ball rides at the end of winch lines from two tractors—in the center of a cable loop formed by the lines—and holds the cables off the ground for efficient snagging or tree felling operations. Each tractor is anchored to a large tree and the pull is made by winch power alone.—Const Meth & Equip, Sept, p42

Blizzard-beating Beams—To eliminate serious interruptions of telephone and telegraph communications, caused by the breaking of live wires in sleet storms, the Rock Island Railroad has installed beamed radio (microwaves) to replace conventional pole-live wires.—Railway Age, Oct 7, p7

System Produces Light—Material glows when it is placed in a fluctuating electric field, needs no sealed glass envelope. The voltage of the field and its rate of fluctuation determine light intensity. Sylvania Electric Products Co. calls it "electroluminescence".—Business Wk, Sept 16, p57

Automatic pH Control—More uniform sizing and better working of paper stock in the jordan are results of automatic pH control on fourdrinier machine at Newton Falls Paper Co. By means of Brown system, half of alum is added prior to jordan and other half at some point after the jordan. Control should be within ± 0.1.—Paper Ind, Sept, p627

Chain-fed Die—Leaf springs that must be bent to predetermined shapes are fed through form die by a chain feeder at Western Electric Co.'s Hawthorne Works. Feeder has 46 roller-chain links between two sprockets 13½ in. apart on die shoe. Positioning is done by locking detent wheel after each advance. Production is 2,500 springs per hr.—Am Mach, Oct 2, p86

Prefabs for Ceylon—Firms all over the world have made bids for the construction of 20,000 middle-class prefabricated houses in Ceylon. Some firms are considering the establishment of factories in the island for mass production of prefab materials.—Eng News-Rec, Sept 7, p59

Hydrogen in Aluminum—Recent experiments show that hydrogen precipitated interdendritically when aluminum alloy solidifies lowers tensile strength and decreases ductility. There was no evidence that dissolved hydrogen embrittles aluminum.—Foundry, Oct, p104

Dentures Are Plastic—Acrylic resins now go into all or part of 90% of British dentures. Fine-grain powders make perfect replicas of natural teeth, even reproducing check lines, decalcification faults, and other character markings.—Mod Plastics, Oct, p148

Sulphur Mining in Italy—Economic Cooperation Administration counterpart funds will be used to put Italy's sulphur mining industry on its feet. Most of these funds will go into exploration for new deposits.—Eng & Min J, Oct, p151

Fuel for Jets—Hydrazine (N_2H_4) is being tested by U. S. Army and Navy as a potential fuel for aircraft rocket engines and internal combustion engines. A nickel catalyst promotes decomposition into nitrogen and hydrogen. Big drawback: cost is $4-5 per lb.—Chem Eng, Sept, p74

Improved Cottons—New triple hybrid cottons with tensile strengths up to 130,000 psi. may be made commercially available 3 or 4 yr. earlier as a result of a seed-breeding program at Oguala, Mexico. Tropical conditions there have permitted rapid stabilization of new combinations in cotton.—Textile World, Oct, p244

Here Is a List of Nylon Plastic Properties

Tensile strength	−70° F.	15,700 psi.	Deformation under load, 122° F., 2,000 psi.		1.4
	70° F.	10,900 psi.	Heat-distortion temperature	264 psi.	150
	170° F.	7,600 psi.		66 psi.	360
Elongation	−70° F.	1.6%	Coefficient of linear thermal expansion per ° F.		5.5×10^{-5}
	77° F.	40%	Dielectric strength, short-time		385 v/mil.
	170° F.	320%	Dielectric strength, 60 cycles		4.1
Modulus of elasticity	77° F.	400,000		10^3 cycles	4.0
Rockwell hardness		R118		10^6 cycles	3.4
Flexural strength	77° F.	14,600 psi.	Power factor	60 cycles	0.014
Stiffness	77° F.	300,000 psi.		10^3 cycles	0.020
Impact strength, Izod	−40° F.	0.40 in.		10^6 cycles	0.040
	70° F.	1.0 in.	Specific gravity		1.14
Flow temperature		430° F.	Water absorption		1.5%
		(exceeded limit of apparatus)	Flammability		Self-extinguishing

***PROPERTIES LISTED** were determined by American Standard Testing Society methods on nylon plastic type FM-10001. Other types of nylon with different properties are available.*

How To Machine Nylon Plastic

Lightness, toughness, flexibility, ease of molding, other unique properties make nylon the ideal material for special textile applications. If you want to try it, here is machining information you will need.

NYLON PLASTIC is available in rod, slab, hollow cast-bushing, strip or tubing form in various sizes. It machines similar to yellow brass.

Keep in mind that nylon is a thermoplastic and subject to the general rules for machining thermoplastics. Nylon tends to soften if care is not taken to dissipate frictional heat generated during machining.

Heat dissipation can be accomplished by the design of the tool, its speed and rate of feed, and the use of cooling agents. Tools should be kept sharp, and vibration of machinery must be avoided.

Best results are obtained if nylon is sawed with a bandsaw. A buttress blade having a No. 4 pitch and a set of 0.004 in. gives good cuts. Variations in length or thickness of cut, speed of cutting, smoothness of cut, and other conditions demand judgment on the part of the individual machinist.

The same drill profile used in drilling Lucite resin is suitable for drilling nylon. Unless the equipment is sufficiently free from play, smooth bores will not be obtained. Clamps or fixtures should be provided for holding the work securely.

The drill should be burnished and deeply fluted to promote chip removal.

Rates of feed must vary inversely with the amount of nylon being displaced. Feeding too rapidly will result in binding of the tool. To avoid overheating, the rate of feed should be decreased as the depth of the bore increases. Proper feed results in smooth, continuous, spiral shavings.

No difficulties will be experienced in turning or in screw-machine operations with standard sharp tools. High spindle speeds and slow feeds will produce a nearly polished surface. Cooling agents may be used.

It is possible to thread or tap nylon with standard thread dies. Either hand or machine methods may be employed. In machine work, it may be necessary to use cooling agents, such as water-soluble oils, or oversize taps, or both.

In milling or routing nylon, the gen-

eral rules for machining thermoplastic materials should be followed. Greater chip clearance, or rake, on the tool is required than for metal.

For nylon, wet sanding is practically a necessity because dry sanding generates enough heat to cause gumming of the stock. Nylon plastic can be successfully polished to a high finish by successively using a fine sandpaper, a wet ashing wheel, and a buffing wheel.

A wet ashing wheel is imperative, and the stock should be kept in constant motion, with relation to the wheel, to prevent "burning". After ashing, a similar wheel is used with a metallic-oxide buffing compound for polishing. The polishing is finished on a clean buffing wheel.

Reaming is not a satisfactory method of finishing a bearing, unless at least 0.010 in. is removed. The resilience of nylon allows a reamer to go through a hole 0.005 in. smaller than the reamer without removing material.

To remove strains, nylon should be machined to within $\frac{1}{32}$ in. of finished dimensions and then soaked in water at room temperature. If the thickest wall section is less than $\frac{1}{4}$ in., soaking time will be 24 hr. for most pieces.

For wall sections approaching $\frac{1}{4}$ in. in thickness, the soaking time should be 48 hr. Thicker sections require longer soaking. After soaking is completed, the sample should be dried in an oven at 70° C. for a time equal to that used in soaking. The sample may then be finished to size.—Textile World, Oct, p103

Smaller Diesel Tractors

Low power-weight ratios are available in two diesel-powered highway tractors announced by General Motors Corp. One model will handle gross combination weights of 45,000 lb. The other will meet needs in the 55,000-lb. range.

A refined version of the GM 4-71 diesel engine develops 133 hp. at 2,000-rpm. governed speed. Drive is through a single-disk, cushion-type clutch eliminating the need for double clutching. Either a 5-speed overdrive or direct syncromesh transmission can be obtained.

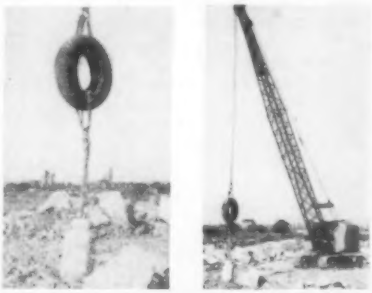
There are two optional axies. One is designed for slow speed work and the other for tractor work, requiring power for hilly or mountainous country and high road speeds in level country.—Am Auto, Sept, p68

How Good Are Fertilizers?

Soil specialists at University of Nebraska have tested effectiveness on wheat fields of various kinds of fertilizers, both alone and in combination.

Last fall 10 lb. of nitrogen were applied, and in the spring 30 lb. of available phosphate and another 30 lb. of nitrogen were applied. Wheat yield was 33 bu. per acre, as compared with 20 bu. per acre for unfertilized fields.

Superphosphate used alone brought a 27-bu. yield in another plot. Nitrogen alone produced 23 bu. per acre.—Chem Eng, Sept, p74



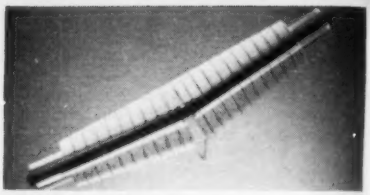
TIRE ELIMINATES WHIP

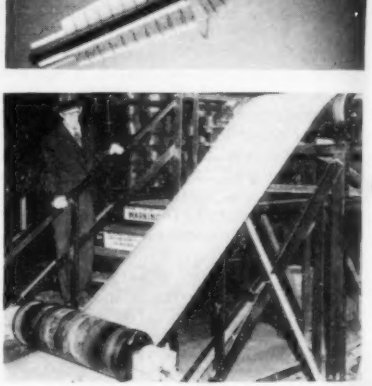
The ball and load line of this skullcracker are lashed to an old earthmover tire that takes up most of the shock and eliminates a great deal of whip in the line. With the tire on the line, operator can pick up the ball immediately after it strikes without the usual wait for the lashing and whipping to subside. Reduction of wear on sheave lips is apparent.—Const Meth & Equip, Oct, p68

How to Cut Water Use 25% in Food-Processing Plants

Jacob Ruppert Brewery made a 25% saving in water in the first 6 months of this year. Estimated money saved for the year is $15,000, minus equipment installation costs of $5,000 for the first year only. The methods, applicable to many food-processing companies, were:

1. Utilizing bottle-washer rinse water in pasteurizer cooling equipment.
2. Collecting condensate from more unit heaters and evaporators.
3. Running air-compressor cooling water to cooling-tower makeup tank.
4. Running air-conditioning cooling water to cooling-tower makeup tank.
5. Collecting and recirculating cooling water for ash-pit doors and coal mills.
6. Reusing water collected from mash filters.
7. Salvaging overflow from regular hot-water storage tanks.
8. Operating filter-mass presses on air instead of water.
9. Supplying toilet bowls and urinals from cooling-tower makeup tank.
10. Rigidly controlling water softener back-washing time.
11. Installing automatic and hand-valve shut-off nozzles on hoses.
12. Testing sprinkler system at small bypass connections.
13. Constantly reminding brewery workers to save water.—Food Ind, Oct, p52





CONVEYOR IS SPILL-PROOF

Roller conveyors have always had one major fault—the cargo they carry has a tendency to slip and fall off. Usual solution is to put side rails or guides on the rollers, but this sometimes damages cargo. Carnegie-Illinois Steel Corp. solved this problem by replacing each individual roller with a pair of slightly tapered rollers placed with their axes at an angle (top). The twin rollers are set so their upper surfaces form an almost horizontal line. As the roller surface turns under its cargo, it is moving slightly inward as well as forward. This produces a force that pushes the load toward the center (bottom).—Business Wk, Sept 30, p57

Gas-Turbine Locomotive

Experimental runs are being made in England with a British locomotive powered by a gas turbine built in Switzerland by the Brown Boveri & Co., Ltd. A single gas turbine drives an electric generator through reduction gearing, the current produced driving four traction motors, two mounted in each truck. Continuous net output of the turbine at the generator coupling is 2,500 hp. Starting on diesel fuel, the turbine is switched to heavy fuel oil when warmed up.

The gas turbine has a single combustion chamber with a replaceable liner. Air supplied by the compressor passes through a heat exchanger, in which it is preheated, and is delivered to the combustion chamber. Fuel oil is sprayed into the combustion chamber by a single centrally located injection nozzle.—Auto Ind, Sept 15, p41

Foamed Plastics Await Commercial Exploitation

Many foamed plastics materials are available commercially or have been produced on a pilot-plant basis. With one exception, all have few successful commercial applications as yet.

Here is a review of some of the more important foamed plastics:

Polystyrene Foam—It is a snow-white material produced by expanding polystyrene 40 times and has a density of 1.6 lb. per cu. ft. Dow Chemical Co. makes it in a rough log form, in the form of boards, or as ground material. First applications were in life rafts, life preservers, and other flotation equipment during World War II. Improved polystyrene foam is now being applied as a low-temperature insulation.

Phenolic Foam—The material, developed by General Electric Co., can be foamed in place. There are no significant applications as yet.

Small quantities of a Westinghouse Electric Corp. phenolic foam are available. No commercial applications have been announced.

Bakelite Div., Union Carbide and Carbon Corp., believes its phenolic foam will find a future in packaging fragile objects.

Vinyl Foam—A unicellular expanded polyvinyl chloride is in pilot-plant production at Sponge Rubber Products Co. It will be applied to specialized insulation requirements.

Cellular Cellulose Acetate—Developed by Du Pont, it is expected to be used in flotation equipment and for sandwich construction of low-pressure laminates (See p 18).—Mod Plastics, Oct. p83

Loosen Stuck Spindles

This method will free stuck spindles on roving frames, will save time, cause less trouble, and increase production:

Mark the position of the bolster on the bobbin rail with a scratch awl. Loosen and remove bolster and spindle without disturbing the spindle gear. The frame may be started when the bolster and spindle are removed.

Run cold water over the bolster and spindle until both are cool. Place the bolster upright in a vise and tap the top of the spindle with a hardwood or lead hammer.

When spindle is removed, scrape and clean the inside of the bolster. Oil the inside of the bolster and replace the spindle and bolster at the next doffing time. Tighten the bolster to the mark made on the rail with the awl. No further setting is required.—Textile World. Oct, p168

THIS IS A TIMES SQUARE SIGN

Huge Eveready flashlight on this Times Square sign in New York City throws a light beam of 800-million candle power. Searchlight uses carbon electrodes to produce exceptionally powerful beam. Electrode movement is controlled by planetary gears that are lubricated with Aquadag to withstand high operating temperature.—Elec C&M, Oct, p89

HEDGE TRIMMER CUTS TRIMMING COSTS 50%

This mechanical hedge-trimming machine trims 2 mi. of hedge per day at $50 per 1,000-ft.—half the cost of hand trimming. Built and used by a power company in Kansas, it consists of half-track truck, 45-ft. steel beam, hydraulic lift, three gasoline engines, three electric motors, and five 36-in. circular saws (arrows) that do the cutting. Cut brush is drawn away from saws by a continuous chain, with hook claws, passing along the top of the beam. Brush drops at side of road.—Elec World, Oct 9, p124

What's Ahead in Steel Making for This Coming Decade

The next ten years should see full development of many steel-making techniques now in the idea stage, or not far from it. Here are particular developments to watch for:

• A continuous annealing and cleaning process that will produce tinplate and have it ready for shipment in 48 hr. is on the drawing board.

• An extrusion process of French origin that may open a new era of mechanical design is in the experimental stage. The process uses a modified hydraulic press and permits continuous hot forming of shapes that cannot be made in rolling mills because of their complex shape.

• Turbo-hearth method is in about the same stage.

• Continuous casting methods show great promise. A Goss machine, based on experimental work in the U. S., will be built by a British steel producer. It will employ a mold 4x16 in. by 5 ft. long and cast 1,000 lb. of steel per min.—Steel, Sept 18, p111

Three-Carrier Knitting

To eliminate rings when knitting 20- and 30-den. nylon, some mills are using a ringless attachment.

The ringless attachment makes it possible to use three main carriers in the knitting of the stocking. Its purpose is to use three separate cones of nylon, alternating from one to the other at the completion of each course.

This method causes the nylon from an individual cone to be used only for every third course throughout the knitting of the stocking. In this way the unevenness of the nylon is neutralized and the appearance of rings in the knitted fabric is reduced to a minimum.—Textile World, Sept, p112

Three-Phase Power from Single-Phase Current

A simple installation at the Eagle-Picher Co. processing plant converts 440-volt, single-phase power into 440-volt three-phase current for the plant. During the work week, electric power for this plant is furnished by three 160-hp. diesel engines. Power bought from the utility company is sufficient for services. To utilize it during shutdowns and to relieve the diesel plant during peak loads require conversions of current from single-phase to three-phase.

Conversion is accomplished by driving a 50-hp., three-phase, 440-volt motor with a 3-hp. single-phase motor and by taking three-phase power from the three motor leads. The large motor, after its rotor has been brought up to synchronous speed, develops a quadrature field, which, combined with the stator field, produces a magnetic field.

Since one phase of the converter acts as a motor and the others act as generators, the three-phase voltage will be slightly unbalanced. Static capacitors improve the voltage balance, as well as the power factor of the system.—Eng & Min J, Oct, p99

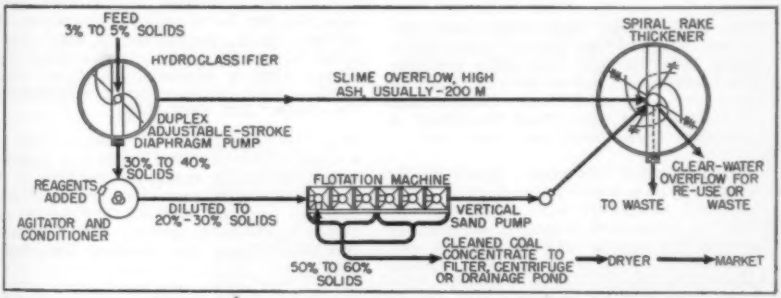
Apprentice Training Is Easy

Apprentice training does not have to be limited to the large organizations. Small plants can make use of it if they follow the Specialties, Inc., plan.

A basic course in engineering drafting is taught right in their plant. The chief draftsman gives a basic engineering education, putting theory and practice together.

The rest of the apprentice training is done by correspondence courses. Specialties, Inc., determines exactly what each man needs and sees that he gets it. Grades are recorded by the company.

Initial care in planning plus a simple record system make administration of the program an easy job. Assignments are planned a year at a time, with the foreman involved, so everybody knows exactly where the apprentices will be.—Factory, Oct, p104



INCREASED COAL RECOVERY BY FLOTATION FOR FINES

Potential in increased efficiency and profits from recovery of waste coal fines makes flotation important to every coal-preparation engineer. Shown here is a simplified coal-flotation flowsheet. Coal fines are first pulped with water and then coated with kerosene or some similar reagent. A froth-producing reagent is added, and the pulp is subjected to controlled agitation and sub-aeration. Agitation and sub-aeration create bubbles that attract and collect the particles of coal and carry them to the surface, where the fines are removed, dewatered, and stored.—Coal Age, Oct, p70

New Products

Motor-pump Unit—The Electrifugal is a close-coupled pump and motor having single shaft. Pump is available with drip-proof, splash-proof, totally enclosed, fan-cooled, or explosion-proof motor enclosure. Motor is specially designed. Motor sizes range from ¾-10 hp. Pump ratings are 10-500 gpm. at heads to 220 ft.—**Allis-Chalmers Mfg. Co.**—Elec World, Oct 9, p162

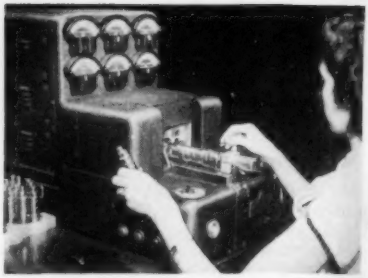
Cuts Plastic Stencil—Machine reproduces complicated drawings and office forms that would be difficult to do with ordinary stencil procedures. It photographs material to be reproduced and by means of a photoelectric-scanner-operated stylus cuts a vinyl plastic stencil.—**Times Facimile Corp.**—Business Wk, Sept 30, p70

Latch Has No Moving Parts—Cupboard latch employs a strong permanent magnet fixed on frame and a plate screwed to cupboard door. It is easily installed, works even when doors sag or warp, holds doors firmly in place, but permits easy opening.—**Laboratory Equipment Corp.**—Eng & Min J, Oct, p126

Fills 500 Jars per Min.—High-speed, 30-pocket, plunger-type filler is adaptable to many types of food and other products. Fill accuracy is ± 0.05 oz. on 8-oz. jars. One part and a few adjustments convert filler to different jar size.—**Food Machinery & Chemical Corp.**—Food Ind, Sept, p94

Truck-mounted Conveyor — Designed for mounting on a standard truck chassis, the conveyor swings through a 100° arc and piles to any desired height. Conveyors are available in lengths to 60 ft. with 24-, 30-, and 36-in. wide trough belts.—**George Haiss Mfg. Co., Inc.**—Const Meth & Equip, Sept, p104

Drip Brazing—New brazing head feeds wire, melts it by gas flame, and drips it on seam about 1¼ in. underneath. Part is carried on conveyor under head. Wire feed is synchronized with conveyor speed. Usual welding speed is 60-120 ipm.—**Metallizing Co. of America**—Weld Eng, Oct, p60



HIGH-SPEED INSPECTION

This specially designed Pratt & Whitney gage checks simultaneously all critical dimensions of a precision eccentric shaft at a rate of 300 parts per hr. Dimensions checked include diameter, bearing concentricity, taper, and eccentric throw. Operator places part in gage cradle and presses button; the machine does the rest.—Steel, Sept 25, p78

Carton Press—Stationary carton cutter and printer is claimed to give more cartons out per lb. of paper, elimination of gripper space, reduction of edge trim, lower paper costs, and easier stock handling. Unit is adaptable to in-line production with printing press.—**Champlain Co.**—Paper Ind, Sept, p662

Magnetic-particle Clutch—Magneclutch is a controllable coupling using the linking action of a dry magnetic mixture in a magnetic field between driving and driven parts to transmit torque. The degree of clutching can be controlled.—**Vickers Electric Div., Vickers Inc.**—Marine Eng, Sept, p97

Motor Speed Preset — A mechanical follow-up control on new AC motor will achieve a fixed preset speed without using expensive control equipment. Once set, the control will bring the motor back to correct speed after the motor has been restarted from a stop or automatic slowdown.—**General Electric Co.**—Coal Age, Oct, p114

Fork-shovel Attachment—Heavy-duty attachment for lift trucks has 7¾-in. tines, making it easy to handle castings, forgings, other loose materials. Shovel can be tilted 40° above horizontal. Maximum loads can be scooped up without ramming the pile.—**Clark Equipment Co.**—Am Mach, Sept 18, p162

Tenses Cables—Faster, more accurate compensation for temperature changes and less maintenance are features of this device. A spring- and hydraulic-operated unit keeps aircraft cables at a specified tension.—**Brobrick Mfg. Corp.** — Aviation Wk, Oct 9, p45

Lightweight Detector—Scout radioactive-ore detector is designed for field survey work, but may be used in school laboratory projects and for safety checks in radiation laboratories. Weight is 2½ lb.—**Allied Radio Corp.**—Electronics, Oct, p126

Axial Fan—Aeromaster fan for large air-conditioning and water-cooling applications is made in dia. from 6-20 ft. Maker claims it to save 10% in power in handling up to 500,000 cfm. of air. Laminated birch blade core is bonded with Penacolite resins.—**Koppers Co.**—Chem Eng, Sept, p155

Circular Sawing Machine—Fast and accurate square or angular cutting off of ferrous or nonferrous materials up to 3 in. round or square is possible on this machine. Special gaging and holding fixtures can be adapted.—**Motch & Merryweather Machinery Co.**—Auto Ind, Sept 15, p 56

Engines Interchangeable—Portable industrial engines are built in three sizes as diesel, gasoline, butane or natural-gas engines. Ratings are about the same regardless of fuel—from 22 to 45 hp. Mountings are interchangeable. All units are available with or without clutch and power takeoff. — **Waukesha Motor Co.** — Power, Oct, p152

Concrete Drill Bits — Extra-short rotary drill bits are designed for drilling holes in concrete and masonry. They have an overall length of 4 in. and are furnished in sizes ranging from ¼ to ⅝ in. The bits may be used in electric drills, air motors, or in a hand brace.—**Concrete Termite Drill Co.**—Eng News-Rec, Oct 19, p114

Reduce Friction on Warp—Rectangular-shaped eye in the new heddle gives the warp yarn a larger surface on which to rest. Strain exerted on the yarn in passing through the heddle is considerably reduced. Heddles are made of springy, carbon steel and are plated against rust.—**H. J. Theiler Corp.**—Textile World, Oct, p145

Heating Glass—New heating element consists of heat-resistant glass on surface of which is bonded electrically conducting coating. This makes possible heating elements of large area or unusual shape. Flat panels are used for industrial drying and baking. Coating on containers or piping can heat contents.—**Corning Glass Works.** —Elec C&M, Sept, p142

TRACTOR DOES DOUBLE DUTY

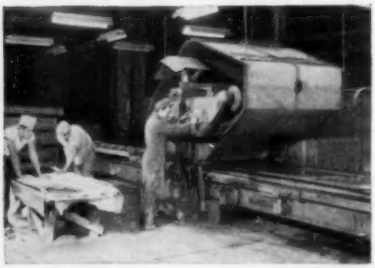
Even the tractor of this Whitehead & Kales Co. auto haulaway has to help carry cars. Two cars are stowed on the tractor, with the hood of one jutting under the driver's cab. Then the trailer part, which carries three cars, is coupled on.—Business Wk, Oct 7, p50

New Products (Cont.)

Control Center—Up to six starters can be mounted in 20x20x90-in. vertical section of control center. "Plug-in" units have positive pressure tabs that grip round vertical busses. Circuit breakers are of thermal magnetic type, while switches are of visible-blade, quick make-and-break design.—**Square D Co.**—Elec Whols, Oct, p99

Air-less Powerguns — Two high-pressure electric-power grease guns will work where air is not available. The 25-lb. gun will handle light or medium greases. The 40-lb. gun handles all types of greases. Motors, in both guns, cut off automatically at 5,000-lb. pressure. — **Alemite Div., Stewart-Warner Corp.**—Ind Dist, Oct, p124

Hysteresis Clutch—PM series hysteresis clutch for up to ½-hp. units is designed for industrial use such as tension control, machine-tool drives, dynamometers, and various duty cycles requiring continuous high-heat dissipation. It can deliver desired torques continuously for given levels of control current independent of slip-heat loss.—**Duncan & Bayley, Inc.**—Electronics, Oct, p268



POLISHES STAINLESS SHEETS

New method to polish stainless-steel sheets up to 49 in. wide and 14 ft. long eliminates scrap loss because of unpolished portions along edges. Developed at Atlantic Polishing Mill Co., method presents full sheet to polishing belt running on four rolls in the Mattison machine. Belt oscillates while the sheet passes back and forth between contact roll and a steel roll directly under it.—Steel, Oct 2, p86

Trucks Refrigerated — Factory-assembled refrigerated delivery trucks with automatically operated refrigerating units are now available in two ranges—10-35° F. and 35-50° F. Body has two access doors and is 12 ft. long. Refrigerating units are self-contained packages with 4-cyl. gasoline engine, 4-cyl. compressor, blower-type evaporator, and Freon refrigerant. Drive unit may be gasoline-electric.—**International Harvester Co.**—Food Ind, Oct, p92

Plastic Seals Stoppings—Tough, durable, acid-proof and fire-resistant plastic may be sprayed on concrete stoppings with standard equipment. It will repair cracks and leaks in overcast and can seal off mine fires.—**R. M. Hollingshead Corp.**—Coal Age, Oct, p110

Straddles Load—Severe service conditions are easily met by this new 45,000-lb. straddle carrier. Designated Series 100, it travels up to 33 mph., is powered by 6-cyl. 140-hp. gasoline engine, has four-wheel hydraulic steering and hydraulic hoisting mechanism.—**Ross Carrier Co.**—Iron Age, Oct 5, p38

Induction Coil Heats Pinion—High tonnage pressure for removing stubborn pinions is unnecessary with this device. The induction coil generates heat within the pinion, which then can be readily pressed off with light pressure by wedges or pinion puller.—**National Electric Coil Co.**—Factory, Oct, p160

Core Wash—Zircon-sand-base core wash is resistant to metal wetting and washing. Fusion temperature is over 400° F. It also has been used successfully as bonding agent for small cores of low permeability, as core paste, as mudding compound, and as chill coating.—**National Lead Co.**—Foundry, Sept, p232

Sorts Metal Parts—Metallurgical characteristics determine sorting of metal parts by new instrument consisting of sorter unit, oscillograph, and test coil. Oscillograph pattern shows characteristics, and sorter takes "intelligence" from screen automatically to operate sorting gates on belt or other type feeder. Sorting rate is one to five parts per sec.—**J. W. Dice Co.**—Prod Eng, Sept, p172

Guides Fabric Feeding—Automatic edge guidance for fast- or slow-moving fabrics feeding into tenters or printing machines is provided by a compact, dual-beam, transmitted-light electronic system. Two narrow beams of light project through a slot in which material moves. Material normally intercepts one beam. Interception of both beams or no beams causes correction.—**Airlectron, Inc.**—Textile World, Oct, p148

Resin Process Equipment—New equipment, called Kemplas, is made of modified phenolic resins in either cast or laminated form. It is suitable for operating up to 350° F. and is resistant to severe corrosive agents except highly oxidizing acids. Equipment includes valves, pumps, fittings, vessels, pipe.—**General Ceramics & Steatite Corp.**—Chem Eng, Oct, p140

Corrugated Steel Adds Strength—Corrugated 16-gage steel sheets form walls and roof of building with no inside supports. In a structure 50x100 ft., gables are strong enough to hold a 32-ton load with little roof sag. Cost is competitive with other types of construction.—**Behlen Mfg. Co.**—Business Wk, Sept 2, p49

Controls Pumps—Pressureflo control adjusts performance of one or more pumps to changes in pressure or flow. It can start and stop pump or change its speeds to meet required conditions. Control can be adapted to old or new distribution system. — **Builders-Providence, Inc.** — Oper Eng, Sept, p70

Pin Fits Hole—Expanding pins of SAE 1095 or stainless steel serve as instrument shafts, dowel pins, cotter pins, pivot pins. Essentially a slotted metal cylinder, pin is compressed to fit hole and is self-locking. It is chamfered so it can be driven into undersize hole.—**Elastic Stop Nut Corp.**—Prod Eng, Oct, p164

Brazes Stainless Steel—At 2,000° F., brazed joints made in stainless steel with new brazing alloy, Nicrobraz, have 99% of parent-metal strength. Alloy is resistant also to organic and alkali solutions. Brazing should be done in hydrogen-atmosphere furnaces.—**Wall Colmonoy Corp.**—Weld Eng, Sept, p44

RADIO FOR PRIVATE RR

Ford Motor Co.'s Rouge plant has 105 mi. of railroad track. Switching with diesel locomotives has been speeded up by installation of two-way radio-telephone communication system. Dispatcher in 42-ft. high control tower relays orders to locomotive engineers. —Electronics, Oct, p128

Fiberglas Insulates Tube—An improved electrical conduit, weighing less than conventional types, is more flexible and provides more uniform shielding and better resistance to moisture, flame, oil, and fungus. It is expected to find applications in aircraft high-frequency circuits.—**National Electric Products Corp.**—Aviation Wk, Oct 16, p37

Glass-fiber Material—New material, Glasweld, is for tube and pipe. Designed as replacement for steel, it is a rustproof, laminated tubing in which glass fibers in the form of cloth, mat, or tape are bonded with resin. It is available as piping for chemical industries and as tubing for electrical industry.—**U. S. Plywood Corp.**—Elec C&M, Oct, p110

READER SERVICE

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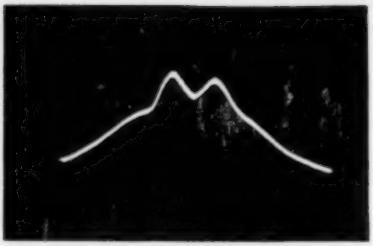
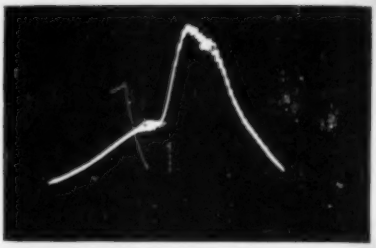


OSCILLOGRAPH PATTERN shows low firing pressure in cylinder; found—a leaky gasket.



NORMAL PATTERN is shown by the cylinder after the fuel-pump gasket was replaced.

Diesel-Engine Ills Diagnosed

The diesel engines in your plant may be costing you more money for fuel than they should. Here is what your operator should do

DIESEL OPERATORS can lose power and efficiency from unequally loaded cylinders if they judge engine operating conditions solely by the exhaust-gas temperatures. But three factors indicate the true condition: (1) compression pressures, (2) firing pressures, and (3) exhaust temperatures. Let's see why.

Automatic fuel ignition in a diesel engine is caused by heat of compression. A 500-psi. compression produces about 1000° F. Also, any change in compression causes from 1½ to 2 times as great a change in firing pressure. So if the compression is allowed to fall, the engine does less work for fuel used.

Many engines are operated with from 50- to 250-psi. variation in firing pressures between cylinders. This is usually the case if the operator determines conditions by difference in exhaust temperatures and tries to keep them the same by adjusting the fuel pump.

Doing this can cause a dangerous out-of-balance condition. Air and fuel must be supplied in uniform volume to get the same power output from each cylinder. Also, cylinders must retain the same degree of tightness.

For most favorable results, the operator should carefully balance, in all cylinders, the compression and firing pressures, fuel-pump rack settings, fuel injection timing, and exhaust temperatures.

Tests can be made conveniently by pyrometer, pressure indicator, and cathode-ray oscillograph. The oscillograph produces a pattern of cylinder-pressure variation vs. time, with degrees of crank angle of each power impulse. Here is what one test showed:

The third cylinder of a 1,600-hp., 4-cycle supercharged engine showed a 200° F. excess exhaust temperature when tested by the pyrometer. Compression pressures were the same in all cylinders, but the firing pressure in the third cylinder was 90 psi. lower than in the other cylinders.

The oscillograph pattern also indicated trouble. Cutting off the fuel to this cylinder cleared up the exhaust. This showed that something was wrong with the cylinder's fuel system. A faulty gasket was found in the fuel-pump delivery check valve.

After the gasket was renewed, the oscillograph pattern became similar to those of other cylinders. Firing pressure

went up 90 psi., and exhaust-gas temperature dropped 200° F.

Had the fuel-pump racks been adjusted to reduce the fuel because of the one high exhaust temperature, both firing pressures and power output would have been lowered.—Oper Eng, Oct, p36

Detachable-Tip Cutting Tool

An unusual turning tool has been developed by Manufacture de la Sambre, Hautmont Nord, France. It has a detachable cutting tip that can be moved longitudinally or laterally on the shank.

The tip is held in place on the shank by clamping screw and by crosswise serrations on its bottom surface engaging serrations in the shank. A high-speed-steel tip would be serrated on its base, whereas a carbide tip would be brazed to a serrated steel supporting plate. The shank is made of half-hard steel with flame-hardened serrated area.

Advantages of the design include tip adjustment after regrinding or breakage, simplified heat treatment of high-speed-steel tips, dispersal of stresses set up by heat during machining without damage to tip, and savings in tool costs.—Mach, Sept 23, p1395

Most Powerful Turboprop

New propeller turbine engine was shown by Pratt & Whitney recently. Called the T-34, it has completed a 50-hr. flight rating test at 5,700 hp.

About 90% of the power produced by the single-unit, high-pressure, axial-flow turbine goes to the propeller shaft. The remainder becomes thrust pounds as it is exhausted at the tail pipe.

Power-weight ratio is better than 2 hp./lb. Specific fuel consumption is 0.62 lb./hp./shp. The T-34 has a 13-stage axial-flow compressor and a three-stage axial-flow turbine with an annular type burner. Two-stage propeller reduction gear operates at a ratio of 11 to 1.—Aviation Wk, Sept 11, p13

English Blast Furnace Has All-Carbon Lining

An all-carbon lining for a blast furnace is being tried at United Steel Companies, Ltd., England. Previous success with carbon bottoms led them into the all-carbon lining.

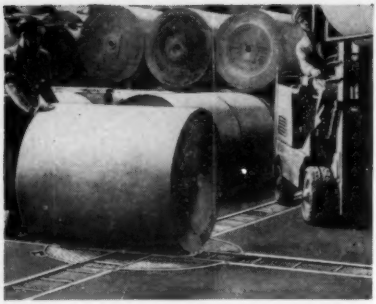
The bosh of the 18-ft. furnace is lined with 9 in. of carbon brick. Both hearth and bosh are shower-cooled. The tuyere belt is cooled with copper plates.

The stack has been well insulated. Otherwise, shell temperatures would be as high as 400° F. The fear of carbon deposition led to the adoption of a carbonaceous fill for insulation.

Since blowing in on April 4, 1949, the furnace has made more iron at a lower coke rate than in a previous equivalent period. Other advantages gained include increased life, simplified construction, elimination of stack cooling, simpler and cheaper hearth cooling, and less chance for scab and scaffold formation.—Iron Age, Sept 21, p88

CHEMICAL CONTROLS MILDEW

Canvas bucket at left has been protected against mold decay by one of the Cunilates developed by Scientific Oil Compounding Co., Inc. But the untreated bucket at right has almost disintegrated after 28-day soil burial test. Active ingredient in Cunilates is Milmer 1, Monsanto Chemical Co.'s copper 8-quinolinolate.—Chem Eng. Oct, p166



TRACK SYSTEM SPEEDS HANDLING

One man can easily push a heavy load on the track system that runs through the Hinde & Dauch Paper Company of Canada plant. Rollers are placed between corrugated walking plates; flat rails at the sides guide the flat metal dolly that carries the load. Change of direction is made on the four-way turntable shown. Advantage of this transportation system is that it doesn't interfere with plant traffic.—Factory, Sept, p93

Heats Cold-Plant Floor

Large concrete-block quick-freeze plant in Ogden, Utah, started cracking in lower-floor slab and around columns supporting the upper floor after only 3 years use. An investigation showed that the intense cold had penetrated the ground-floor insulation to such an extent that a solid block of ice, 8 ft. thick, had formed under the building.

The existing floor, consisting of 8 in. of concrete, 4 in. of cork, and 4 in. of concrete on top, was covered with heavy paper and sealed with hot tar. An electric soil-heating cable was then laid on the paper, covered with reflector aluminum foil, 2 in. of asphalt mulch, 6 in. of cork, and 4 in. of new concrete floor.

Ground-level temperatures are now taken daily in all first-floor rooms. When the temperature drops to 29° F., heat is turned on until it rises to 33° F. Power is on about 25% of the time in a 1-month cycle.—Elec West, Sept, p67

British Make Advances in Electronic Equipment

Recent British developments in electronic equipment have resulted in some novel applications of electron tubes. For example, a meter to determine size of carbon particles in luminous flames has been invented by the British Iron and Steel Research Association. Its principle is detection of ultra-violet light scattered by the particles.

Magnetic fields can be measured by an instrument with a small flake of germanium. When germanium is pure enough, its electrical resistance is a measure of the magnetic field.

A new pyrometer for use above 750° C. consists of a back-silvered, heat-resisting glass hemisphere. Black-body radiation can pass through a small unsilvered hole at the top to a photocell. Cell current then indicates temperature of the hot surface.

Developments in the field of photo-conductive cells include a miniature lead-sulphide cell for applications where the cell will not be cooled; a coolable lead-sulphide cell that can use liquid air, solid CO_2, or circulating water as coolants; and an experimental lead-selenide cell with sensitivity (at liquid-air temperature) to cover 5 μ.—Electronics, Oct, p182

New Steel For TV Tubes

A stainless steel with only 17% chromium, instead of the original 28%, has been developed by U. S. Steel Corp. for the metal envelope of television picture tubes. Other steels previously used for this purpose had a different rate of expansion and contraction from glass, causing the glass to crack during sealing.

The new steel, designated USS 17-TV, is formed to shape by spinning a blank into a round envelope from which the rectangular tube is produced.—Steel, Oct 2, p59

New Contact Process Revamps Sulphuric Acid Manufacture

Sulphuric acid contact plant built by Chemical Construction Corp. for American Cyanamid Co.'s Hamilton Works incorporates radical new principles. Result is a marked increase in conversion efficiency, a reduction of 90% in cooling-water requirements, a simplified plant of one-third to one-half the usual ground area, and unusual ease of adjusting product concentration.

The new process eliminates towers, air drying, and nearly all heat-exchange and cooling surfaces. Preliminary steps of sulphur melting, pre-coating, filtering, burning, and then cooling in a waste-heat boiler are similar to the conventional contact process, except that no drying tower is needed to dry air and avoid acid mist formation. SO_3 content of the gas is higher—about 12% compared with 8%.

The first big difference is in conversion. The new converter uses four catalyst stages with cooling between stages. Cooling is by direct air mixing without heat exchangers.

PIPE LINE WEIGHTED

Area around Mississippi River where this pipe line was laid is subject to floods. So the 26-in. pipe was coated with 2-in. layer of concrete, reinforced with wire, to give added weight and protection. Line will carry natural gas for the Tennessee Gas Transmission Co. from Texas to West Virginia.—Oil & Gas J, Sept 21, p178

Converted gas enters a horizontal absorber and is absorbed in two stages—first in acid of product strength, then in weak acid. The strong acid is cooled and stored. The weak acid, which absorbs remaining SO_3, overflows as makeup for the first stage.

Exit gases from the second stage pass through a venturi scrubber and a cyclone separator, and leave at the exit stack with less than 0.1% SO_2 and 0.5 mg. of sulphur as H_2SO_4 per cu. ft.—Chem Eng, Oct, p102

Stripping Without Shooting

A newly designed high-lift, medium-weight, heavy-duty shovel is stripping up to 50 ft. of clay and hard sandstone and shale without shooting at the Superior Coal Strippers Inc. strip mine. Output is 500 tons per day.

The shovel is a Manitowoc 4500, driven by a 550-hp. Cummins diesel engine. Shovel boom is 60 ft. long; tubular stick, 50 ft. long. Dipper handles 4 yd. of material. Shovel design provides for compact shipment with a minimum of dismantling.—Coal Age, Sept, p94

Checks Dielectric Constants

New microwave interferometer built at U. S. Naval Research Laboratory has proved useful in the rapid determination of dielectric constants of material in sheet form. It is particularly suitable for study of laminated radome materials, of parallel-plate media of nominal dielectric constant less than one, and of metal-loaded artificial dielectric materials for microwave lenses.

The interference pattern in the microwave interferometer is produced between a reference signal led through a wave guide and a signal reflected from a movable metal reflector and a fixed half-reflecting mirror. Phase and amplitude of a plane wave can be compared with that of a reference signal.—Electronics, Oct, p236

Stainless-Steel Beer Barrel Assembled by Inert Arc

Beer barrels are made from stainless steel by inert-arc welding at Industrial Stamping & Mfg. Co. Parts assembled by welding include bottom chime, bottom, body, top, top chime, bung plate, bung ring, and tap plate.

The body is rolled from flat sheets of 16-gage type 304 stainless steel and longitudinally welded by inert arc at a welding-head speed of 24 ipm. Chimes made of the same stock are fabricated by welding.

The bung plate is then welded to the inside of the body and the bung ring to the outside on suitable welding fixtures. Hydrogen gas is burned beneath the plate and ring to avoid oxidation.

Top and bottom chimes are now fitted to the body in another fixture, and circular seams are inert-arc welded from the inside—again with a hydrogen back-up. The fixture rotates the barrel past the torch inserted through the tap opening in the top.

The tap plate is welded on last to complete the barrel. A turntable fixture rotates the barrel, which is upright, under the torch. Testing, pickling, cleaning, washing, and final testing ready the barrel for its first beer.—Weld Eng, Oct. p47

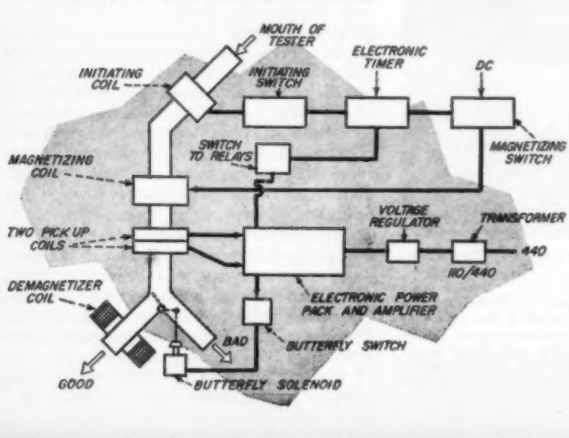
Cotton-Opener Successful

As mechanically picked cotton is dirtier than cotton picked by hand, the textile industry has needed a better way to open, clean, and fluff baled cotton. The U. S. Dept. of Agriculture's Southern Regional Research Laboratory has developed a machine to do this job.

It has a number of toothed gin-saw or "licker-in" wire cylinders. They are arranged one above the other, and all rotate in the same direction. The cotton forms a soft roll as it is fed into the machine on a conveyor belt.

Cylinder teeth pull small tufts from the roll. Tufts are then removed from the teeth by a doffer with metal blades.

A machine that needs 6x9 ft. of floor space can treat 2,000 lb. of cotton per hr. Larger units can be built. Despite the high operating speed, the machine causes no neps, even when processing immature cotton—Steel, Sept 18, p87



CHECK HARDNESS BY ELECTRONICS

Rocker arms for General Motors engines are checked for hardness by automatic electronic tester. Principle of tester is that magnetic retentivity is function of hardness. Harder casting retains more magnetic lines of force. Test piece passes through initiating coil that energizes magnetizing coil. Magnetized piece induces current in pickup coils, which operates valve to pass or reject piece.—Am Mach, Sept 18, p118

In the Next 10 Years, Look for these NEW Metals:

- ***NEW Stainless and Alloy Steels***
- ***NEW Metals for High Temperatures***
- ***NEW Metals for Structural Uses***
- ***NEW Metal-Ceramic Combinations***
- ***NEW Light-Metal Alloys***

Progress in Metals and Alloys

Report to Management

NEW METALS, new processing methods, new ways to use old metals, and new ways to use old methods will be of urgent significance in the next decade to meet the increasingly severe demands of industrial competition. In many countries too, their utilization will vitally concern the defense efforts being made.

In the following pages, noteworthy advances in the metal field are summarized for your information and reference. Many of the developments have been announced previously in the McG-H Digest. Some are already available for purchase, although they have not been completely evaluated. Others are just out of the research stage. In either case, they will reach their fullest development in the next 10 years.

Stainless Steels

While conventional stainless steels are increasing steadily in demand, special types are under development and study.

Tantalum-bearing Stainless—A most important development in the stainless-steel field is the production of tantalum-bearing stabilized grades. Tantalum's present impetus for its wider use in columbium-stabilized Type 347 is caused by the increased demand for this alloy for high-temperature service.

Columbium ores rich in tantalum are now being processed. And a new iron-tantalum-columbium (40-20-40) alloy has been developed for adding columbium and tantalum to Type 347 and to super-alloys.

In Type 347, two points of tantalum are required to replace one point of columbium to stabilize the steel. Several heats have been successfully made by using the 40-20-40 alloy with its 2:1 columbium-tantalum ratio.

Low-carbon Stainless—What may be regarded by many engineers as an even more significant development is the production of extra-low-carbon stainless steels; carbon content is not over 0.03%. They are mainly Types 304 and 316 that have been made practical by use of oxygen in the furnace and the development of extra-low-carbon grades of ferro-chromium.

These steels can often replace the more costly stabilized grades. They can be used as welded and stress-relieved structures in place of the austenitic steels which require columbium or titanium.

They also can replace the stabilized grades for applications in as-welded conditions that involve short heating time in the sensitizing range or for equipment of such size that it must be stress-relieved for periods up to 2 hr. in the dangerous temperature zone.

In such service, low-carbon stainless shows neither intergranular corrosion nor any corrosion in the weld area. As large welds need not be annealed, field

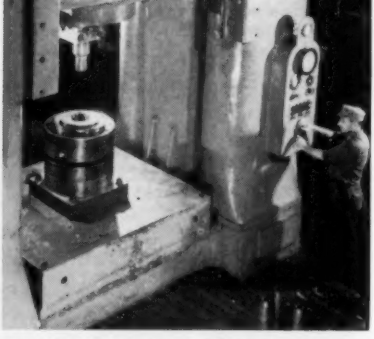
repairs on low-carbon stainless-steel equipment are simple and large assemblies can be fabricated by welding.

Precipitation-hardening Stainless — These steels, another new development, require only one heat treatment after cold rolling or drawing. Heavy cold reductions followed by precipitation hardening result in high tensile and elastic properties.

One steel of this type has 17% chromium, 7% nickel, and aluminum as the precipitation element. This steel is for sheet, strip, plate and wire applications requiring good corrosion resistance and extremely high mechanical properties.

Another steel with 17% chromium and 4% nickel contains copper as the precipitation agent. It is suitable for bar and billet forging applications.

Precipitation hardening can increase normal tensile strengths of about 90,000 psi. to as high as 150,000-175,000 psi. The corresponding elongation of 50% would be reduced, possibly to 10%; this would still be within the fabricating range.



NEW PROCESSES include cold extrusion of steel as accomplished on special hydraulic presses, such as this Lake Erie 3,000-ton long-stroke high-speed press at Mullins Mfg. Co.

Superalloys

Demand for superalloys, developed during and shortly after the last war (McG-H Digest, Dec '47, p49), is still growing. These radically new alloys meet the requirement of high strength at high temperature. They contain large amounts of chromium, titanium, molybdenum, and cobalt.

Two new alloys have promise for structural uses at 1600–1800° F. One is a chromium-molybdenum-iron alloy, the other a chromium-molybdenum-nickel. The first one, with an analysis of 60% chromium, 25% molybdenum and 15% iron, has extremely high resistance to stress rupture at high temperatures.

Both alloys are fairly brittle at high temperatures, but addition agents are expected to reduce the brittleness. At present, the alloys are being applied experimentally to castings only, but forging grades are planned for development.

Titanium Alloys—Titanium and molybdenum alloys offer even greater promise in the high-temperature field because they can be produced in sheet, strip, tube and rod forms, as well as in forging grades.

The titanium picture (McG-H Digest, Feb, p53) is developing rapidly despite its high cost. Tubing is now available in sizes ranging from ¼-in. O. D. by 0.010-in. wall to 1¼-in. O. D. by 0.075-in. wall and in lengths to 10 ft. Tubing is either formed from strip, welded, and then drawn or drilled and cold-drawn from bar stock.

Among the more promising new alloys is one developed by P. R. Mallory & Co., Inc., under Navy sponsorship. Composition is 3% aluminum, 5% chromium, and small percentage of carbon.

The alloy can be forged readily at 1650–1725° F. Typical properties are 175,000-psi. tensile strength, 155,000-psi. yield strength, and 8–10% elongation in the as-forged condition after an 85%

reduction in area. Cast ingots up to 250 lb. have been successfully hot-forged.

Almost all significant applications at present are being made to aircraft. Forged jet-engine rotors, compressor blades and disks, and skin around high-temperature elements of aircraft where stainless steel formerly was employed are being made of titanium. Strength-to-weight ratio is of primary importance for such uses.

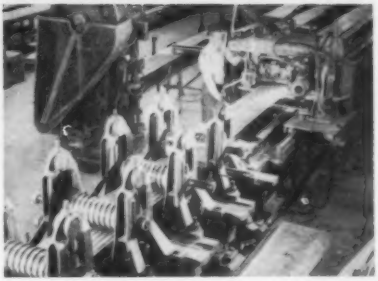
Marine applications are foreseen too because of the outstanding chemical inertness of titanium, plus its high endurance ratio and high resistance to corrosion fatigue. Look for its use for valve seats, heat exchangers, condenser piping systems, exhaust mufflers for submarine diesel engines, pump shafts, small propellers and propeller shafts, and steam-turbine blading.

Molybdenum Alloys—For high-temperature service above 1800° F., molybdenum and molybdenum-base alloys are the most promising and exciting, particularly for sheet applications.

Properties at elevated temperatures are superior to many currently used alloys. Above 1830° F., its creep strength is higher than those of alloys of iron, nickel, and cobalt. Hardness decreases little in the 1000–3000° F. range. Tensile strength decreases slowly as the temperature rises.

As far as its possible structural application is concerned, the most important chemical property of molybdenum is its extremely poor oxidation resistance above 1400° F. This serious limitation must be overcome before it becomes practical as a heat-resistant material.

Look for its use in numerous high-temperature services, including turbine blades, combustion chambers, guide vanes, and other parts of gas turbines, rockets, guided missiles.



***STAINLESS STEEL** is formed by this roll-forming machine into corrugated strips at Budd Co. Roof sections for passenger railroad cars are formed from 85-ft. strips welded together.*

Cobalt Alloys—A new alloy for sheet-metal components of gas turbines contains cobalt (50%), chromium, nickel, and tungsten. It has high strength resistance up to 1800° F. and resistance to oxidation and carburization up to 1900° F.

Numerous aircraft sheet-metal parts—small fabricated blades to larger afterburner assemblies—have been fabricated from the alloy. Workability and weldability are satisfactory.

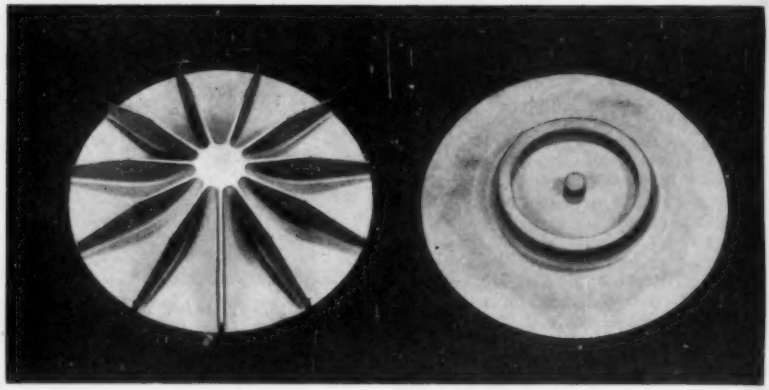
Another relatively new cobalt-base alloy is finding use as a spring material, both at normal and elevated temperatures. It contains 40% cobalt, 20% chromium, 15% nickel, 15% iron, 7% molybdenum, and small amounts of manganese and beryllium.

Metal-Ceramics

About 2000° F. appears to be the top temperature limit for highly stressed parts in "purely" metallic alloys. Indicated for higher temperatures are ceramics, ceramic-metal combinations, or ceramic-coated metals.

Ceramic-metal combinations (also called cermets or metamics) combine thermal shock resistance of metal alloys

***FRONT COVER**—As metals grow in use, their finishes must advance to protect them and to furnish eye-appeal. These sheet-metal and die-cast parts have been finished with wrinkle, one-coat and Dimenso hammer.—Courtesy of Sherwin-Williams Co. and Product Engineering.*



GAS-TURBINE IMPELLER is made of metal-ceramic consisting basically of titanium carbide with 20% cobalt. Such ceramets are widening considerably the scope of high-temperature design.

with high-temperature strength of ceramics.

Two sintered titanium carbide compositions, each with about 20% cobalt, are particularly interesting. Tensile strengths at 1800° F. are higher than those of any high-temperature alloy or ceramic.

On a strength-weight basis, tensile values become quite high because specific gravities are only two-thirds that of steel. Low thermal expansion and high thermal conductivity help increase the thermal shock resistance. Application: powder-pressed or extruded into turbine blades, bushings, nozzles, valve seats.

Another new metal-ceramic is a fused aluminum oxide bonded with chromium. It is available commercially.

A relatively new group, trade-named Ferramics, consists of various oxides, such as Fe_3O_4, MnO, ZnO, and NiO. They are ferro-magnetic, exhibit many of the mechanical properties of other oxide bodies (porcelain and steatite), and are semi-conductors.

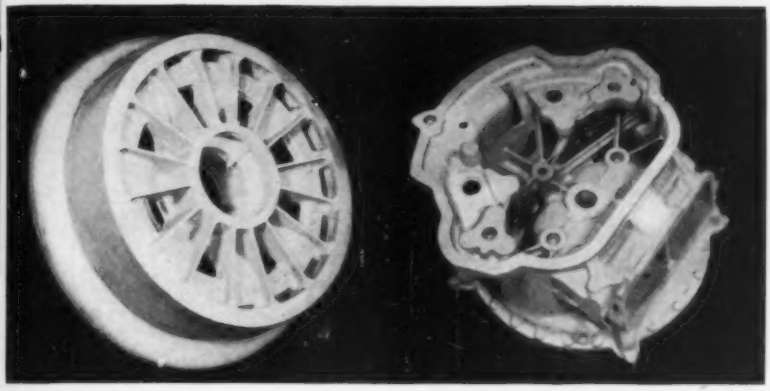
Look for their expanding use for cores employed at audio frequencies and up into the high mega-cycle range at medium power levels; example is in television circuits. They fill a gap in the frequency spectrum—between laminated iron cores that handle large amounts of power at low frequencies and powdered iron cores that handle small amounts of power at high frequencies.

Magnesium Alloys

As urgent as the search for high-temperature alloys is that for lighter-weight, higher-strength alloys. An immediate need for such materials is for many military vehicles that in a modern war can be carried by air.

Completely new types of magnesium alloys promise to meet this need. Among them are magnesium-zinc, magnesium-zirconium, magnesium-lithium, and magnesium-cerium.

The magnesium-cerium alloys are expected to perform successfully certain structural services at intermediate temperatures. Many such magnesium-"rare earth" alloys are made with a material known as Mischmetal, containing 50% cerium, 20% lanthanum, 18% neo-



MAGNESIUM ALLOYS continue to expand their range of applications. Aircraft wheel and engine parts are made of a magnesium-zinc-zirconium alloy of high strength-weight ratio.

dymium, 6% praesodymium, and lesser amounts of other elements.

These alloys look extremely promising, especially when produced as sand castings. Immediate applications are for aircraft engine parts operating at temperatures up to 600° F.

A new alloy under study is a magnesium-zinc-zirconium-silver alloy. Tensile strength is 60,000 psi., yield strength is 40,000–45,000 psi., and elongation is 10–15%. Look for its use in airfield landing mats.

Magnesium-lithium alloys, still in the development stage, have strength-weight ratios equal to the strongest aluminum alloys, densities equal to or lower than magnesium, and improved cold-rolling and cold-forming characteristics. Alloys usually contain 10–15% lithium and about 5–10% zinc. Aluminum also may be added to these alloys.

A relatively new extrusion alloy is ZK60A, which contains 5.7% zinc and 0.6% zirconium. Its excellent strength, toughness, and resistance to notch sensitivity are due to the presence of zirconium. Look for its use in truck and trailer floor sills, textile machinery, materials-handling equipment, in addition to its present applications in the aircraft industry.

Aluminum Alloys

A development of particular importance is the extrusion of aluminum-alloy ribbed sheet (McG-H Digest, July, p30). After a shape is extruded, it is straightened by stretching it slightly past the elastic limit. Then it is slit to open to a circular cross-section and flattened out.

Making a similar piece with T-shape stiffeners would require a thick piece of aluminum for milling, thereby leaving only a thin sheet with reinforcing ribs. The saving in volume of metal is considerable.

A similar advance is the rolling of aluminum-alloy "tapered" sheet for aircraft construction. This process speeds production of complicated shapes and decreases waste.

New forged aluminum disk wheels are now available for trucks, trailers, and buses in 7.50 x 20 and 7.50 x 22 sizes. Their light weight allows a direct in-

Properties of Zirconium Alloys*

Alloying Element	Limit of Addition Studied - %	Heat Resistance** at 1200° F.	70° F.			1200° F.		
			Tensile Strength, psi.	Yield Strength, psi.	Elongation - %	Tensile Strength, psi.	Yield Strength, psi.	Elongation - %
Aluminum	5	C	120,500	96,300	7.5	54,500	24,600	26
Chromium	10	B	101,900	79,300	5.0	25,500	14,900	12
Molybdenum	10	C	145,000	136,000	7.0	43,180	14,750	44
Nickel	10	A	87,200	75,000	1.0	18,000	9,400	57
Tantalum	15	C	124,800	92,000	9.0	36,900	16,500	20
Titanium	90	C	162,300	139,100	3.0	24,700	17,300	77
None	..	B	.....	36,000	...	.....	9,100	..

* The strength properties are the highest strengths reported and do not necessarily correspond to the highest alloy content.

** A – weight gain less than 600 mdd. (mg./sq. decimeter/day)
B – weight gain 600-1500 mdd.
C – alloy disintegrated in less than 24 hr.

crease in pay load without exceeding maximum axle loading.

Two other new developments are (1) a die-casting alloy with 4.3% silicon, 1.8% magnesium, and 3.5% zinc and (2) an aluminum-coated steel-core wire that is replacing usual galvanized core for short 440-volt transmission lines.

Copper Alloys

Advances recently made in copper-base alloys include:

- A new brass especially adapted for drawing and stamping and characterized by exceptionally fine grain, ductility, abrasion resistance, and surface smoothness that greatly reduces buffing and polishing costs.
- New bronzes for deep-drawing dies for stainless steel. One such bronze, which has minute hard particles uniformly dispersed in a softer matrix, gives dies of long life, freedom from galling and scratching, and lower maintenance.
- Casting of brass cakes in weights over 3,000 lb., making available finished brass in sheet form wound in coils up to 24 in. wide.

Zirconium Alloys

Development of commercially pure zirconium has somewhat paralleled that of titanium. While the same degree of use is not expected for zirconium, its outstanding corrosion resistance will insure widespread applications.

Zirconium is about 45% heavier than titanium. It does not show as good strength-weight ratios as titanium or high-strength aluminum or magnesium alloys. On an equal volume basis, strength of zirconium is about equal to that of copper-base alloys.

Corrosion resistance of zirconium is good. Its resistance to corrosion by alkalis is better than that of tantalum, titanium, or 18-8 stainless steel. Resistance to acid attack is satisfactory, except for hydrofluoric and concentrated sulphuric and phosphoric acids.

At elevated temperatures, zirconium reacts rapidly with oxygen and nitrogen,

resulting in hardening and embrittlement. Hydrogen is absorbed above 600° F., but can be removed by heating at about 1500° F. in vacuum.

Zirconium can be forged readily at 1200–1290° F. It is adaptable to stamping and drawing of small parts. Rod and wire can be produced by hot and cold swaging and rolling. Hot working requires periodic cleanings, while cold rolling demands intermediate anneals. Hot extruding, welding, machining, riveting, crimping, and slotting present no particular problems.

Extensive research is underway on development of alloys of superior strength and temperature-resistant properties. Tensile strengths of present alloys at 70° F. run up to 162,000 psi. with titanium, as shown in the table.

At high temperatures, values are irregularly lower. Aluminum has the greatest effect in increasing hot strength—54,500 psi. at 1200° F. Strength of the zirconium-titanium alloy at the temperature is only 24,700 psi. Alloys with best heat resistance at elevated temperatures have lowest high-temperature strengths. Look for zirconium to replace tantalum for certain applications where excellent resistance to alkalis and acids is needed.

Rare Metals

Requirements of maximum density, mass, or inertia in a limited space are met by practically pure tungsten, which is now commercially available. Parts can be machined from standard shapes or fabricated by powder metallurgy. While the only use up to the present has been in the lamp and electronic-tube industry, look for it to go into rotors, flywheels, governors, and balance weights.

Availability of germanium, which is a semi-conductor, has led to its use as diodes in photocells and television receivers. Look for its use expanding in such fields because its compactness and high sensitivity reduce unit sizes.—Prod Eng, Oct, p87

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946

Title 39, United States Code, Section 233 of McGraw-Hill Digest published monthly at New York, N. Y., for October 1, 1950

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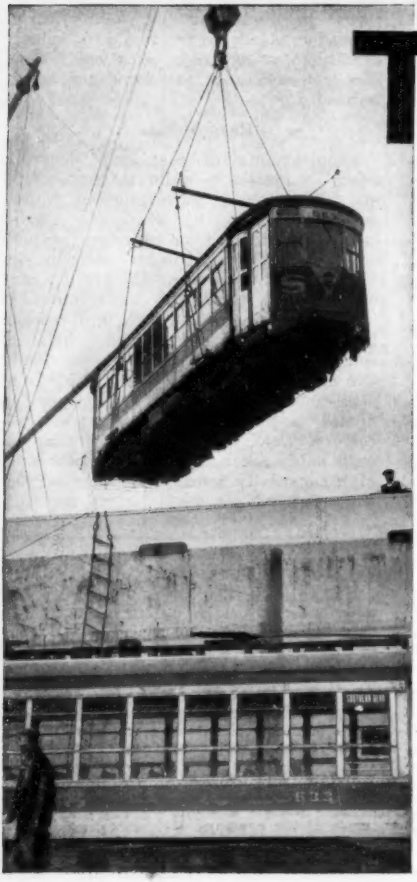
Sworn to and subscribed before me this 15th day of September, 1950.

ELVA G. MASLIN

Notary Public, State of New York, No. 30-7,750,500.

(My commission expires March 30th 1952)



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Production Ideas

from Manufacturers' Catalogs

12-1 Molding Powder — Hercules Powder Co. 16p. Booklet 500-114 can help the plastics molder choose the right cellulose acetate molding powder for the specific job.

12-2 Electrical Equipment—Allis Chalmers Mfg. Co. 20p. Motor starters for 2,300-5,000 volt squirrel-cage, wound-rotor, synchronous and multispeed motors are described in bulletin 14B6410A. High-voltage air break contactor is described in bulletin 14B7303.

12-3 Mailing Machines—Pitney-Bowes, Inc. 64p. General catalog describes postage meters and mailing machines that can help prevent pilferage of postage stamps and can expedite large volume mailing in government and business.

12-4 Farm Machines — International Harvester Export Co. 20p. Two catalogs, E-111-NN and E-78-NN, describe a heavy-duty hay rake and a tractor-mounted power loader.

12-5 Bronze Electrodes—Ampco Metal, Inc. 24p. Wide range of bronze electrodes is described, and additional information is given on procedure, application, and uses in bulletin W-17.

12-6 Croning Process—Union Carbide & Carbon Corp. 16p. Bulletin describes how sand-and-resin molds for metal casting are made by process (McG-H Digest, Oct, p25).

12-7 Foamglas for Insulation — Pittsburgh Corning Corp. 36p. Booklet G0410 gives you specifications for installing Foamglas insulation in roofs, floors, sidewalks, walls, and ceilings.

12-8 Vertical Turbine Pumps—Deming Co. 24p. Bulletin 4700 describes the important features and applications of vertical turbine pumps.

12-9 Rolling-Mill Machines—Birdsboro Steel Foundry and Machine Co. 30p. Machinery for blooming, slabbing, and billet mills; bar and structural mills; sheet and strip mills; and tube and pipe mills is described in "Rolling Mill Machinery Catalog."

12-10 Reproduction Materials — Eastman Kodak Co. 20p. Brochure FI-36 tells how Kodagraph reproduction materials can provide faster, more economical copying processes.

12-11 Magnet Wire—International General Electric Co. 32p. Development, properties, and applications of both film-type and asbestos and glass-insulated magnet wires are covered in booklet 19-329.

12-12 Stainless Steel for Hospitals—Allegheny Ludlum Steel Corp. 36p. Booklet SS16ED1-1 illustrates the use of stainless steel in modern hospitals.

12-13 Drills, Bores, Taps—National Automatic Tool Co., Inc. 20p. Catalog 749 contains information on how to select production machine tools.

12-14 Mechanical Draft Fans — Buffalo Forge Co. 36p. Construction, application, and installation of fans and blowers are detailed in bulletin 3750.

12-15 Textile Equipment—Abington Textile Machinery Works. 20p. Two pamphlets describe vacuum card-stripping systems and beam and package dyeing in detail.

12-16 Grinder Attachments — Taft-Pierce Mfg. Co. 16p. Catalog 310 shows attachments and accessories that extend the use of surface grinders and increase operating speed.

12-17 Variable Speed Drives—Link-Belt Co. 88p. Catalog 2274 covers design data on installations and applications of positive, infinitely variable speed transmissions.

12-18 Safety Shoes—International Shoe Co. 48p. Shoes with built-in special protection for every job in industry are described in catalog 12.

12-19 Bearing Balls—Abbot Ball Co. 20p. "Bearing Balls and Burnishing Materials" is a compilation of basic facts and figures concerning bearing balls, burnishing materials, burnishing barrels.

12-20 Air Control Valves—Logansport Machine Co., Inc. 44p. Design, installation, operation, and maintenance of many types of air valves is described in catalog 100-S4.

12-21 Pharmaceutical Chemicals — Dow Chemical Co. 116p. Properties of pharmaceutical chemicals and intermediates are listed in booklet DP3-V-450.

12-22 Heavy-duty Trucks—Mack Mfg. Corp.

Production Ideas (Cont.)

20p. An off-highway truck or tractor and a truck for the timber and pulpwood industries are described in bulletins 1-49-7.5M and 1-49-5M.

12-23 Heat-resistant Tubing — Babcock & Wilcox Tube Co. 46p. Detailed information on the properties and applications of chromium-molybdenum steel tubing is contained in technical bulletin 9B.

12-24 Plastic Properties — Libbey-Owens-Ford Glass Co. 58p. "Plaskon Molding Compound Handbook" lists the properties of molded Plaskon and techniques of molding it.

12-25 Mechanical Pump Seals—Byron Jackson Co. 12p. Bulletin No. 49-10000 describes seals for centrifugal pumps handling liquids.

12-26 Locomotives — Plymouth Locomotive Works. 44p. A complete line of standard- and narrow-gauge locomotives from 2½ to 70 tons powered by gasoline or diesel-mechanical and diesel-electric power is covered in catalog LG-49.

12-27 Classifiers—Hardinge Co., Inc. 20p. Discussion of liquid classifying and separating devices is contained in bulletin 39-B.

12-28 Treated Paper Survey — American Cyanamid Co. 20p. "Quality Advantages Gained with Alwax Sizes" lists grades of paper and paperboards with qualities given to them by Alwax or Waxine sizes.

12-29 Drill Presses — Cincinnati Lathe & Tool Co. 16p. Floor drills, multiple drills, bench drills, and radial drills are all described in bulletin 90.

12-30 Make Your Own Gas—Tirrill Gas Machine Corp. 15p. Bulletin covers gas machines that operate on gasoline or pentane to produce gas of 500-1,500 Btu.

12-31 Casing Scrapers — Baker Oil Tools, Inc. 24p. "Baker Casing Scrapers" describes tools needed to maintain the inner surface of a well casing.

12-32 Jig Borer—Fosdick Machine Tool Co. 20p. Catalog 17P describes model 42P jig borer with automatic positioning accurate to within ± 0.0001 in.

12-33 Heat Exchangers—Patterson Foundry & Machine Co. 20p. Booklet 508 describes the Patterson standard line of heat transfer equipment and its applications to the process industries.

12-34 Stainless-steel Valves—Cooper Alloy Foundry Co. 48p. Stainless-steel valves, fittings, and accessories are listed in detail in catalog 52.

12-35 Machine Tools—Brown & Sharpe Mfg. Co. 72p. Three booklets contain information on new tools, arbors, adapters and collets, and end mills.

12-36 Mine Conveyors—Joy Mfg. Co. 28p. Belt conveyors in a wide range of sizes to meet almost every mining application are illustrated in bulletin LD-100.

12-37 Get the Most Out of Files—Nicholson File Co. 48p. A brief account of the history, manufacture, types, and uses of files in general is found in "File Filosophy".

12-38 Strategic Construction—Koppers Company, Inc. 52p. "Engineering Services" outlines services available to people connected with strategic construction projects.

COPIES of these manufacturers' catalogs will be sent free to subscribers. Fill in squares with catalog numbers desired and mail to the Editor, McGraw-Hill Digest, 330 W. 42nd St., New York 18, N. Y., U. S. A.

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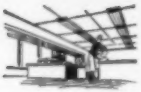

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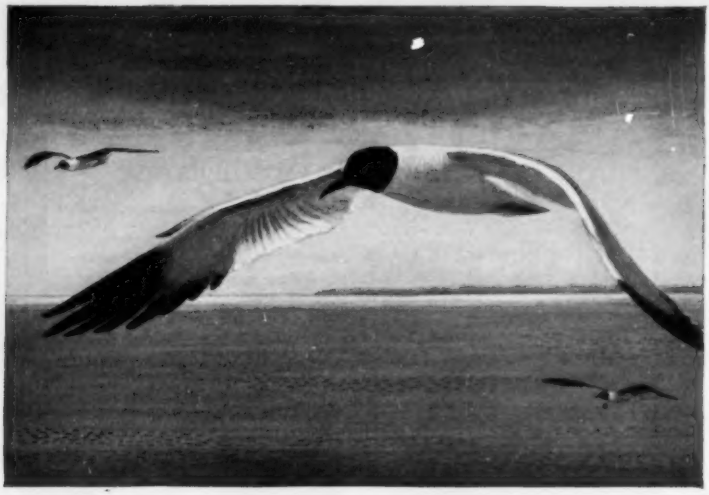

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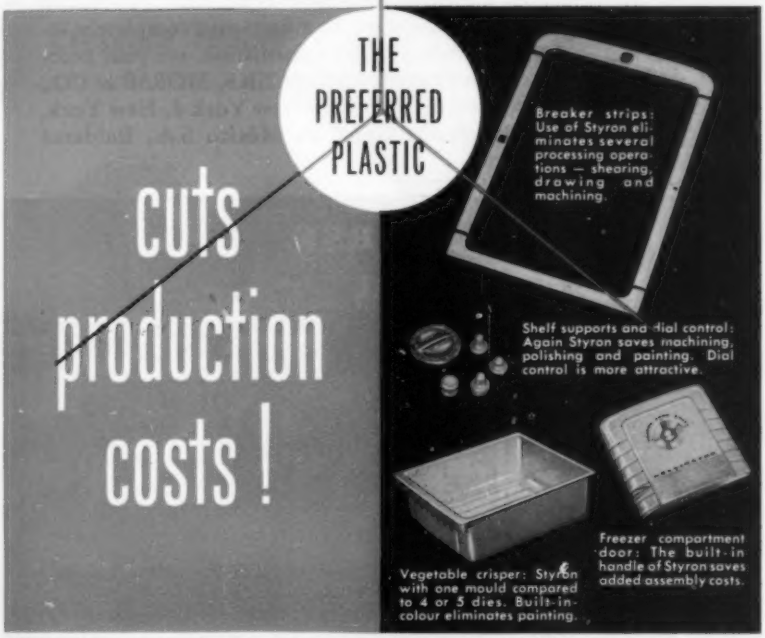
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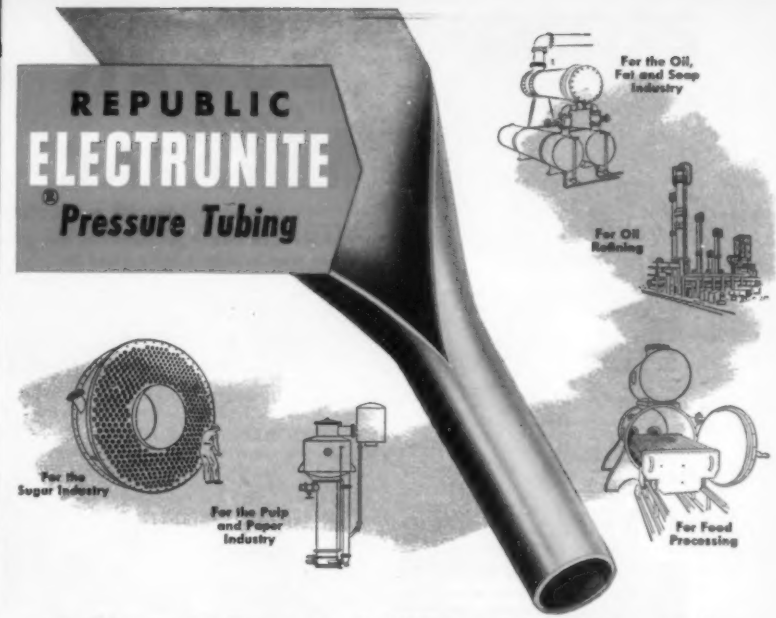

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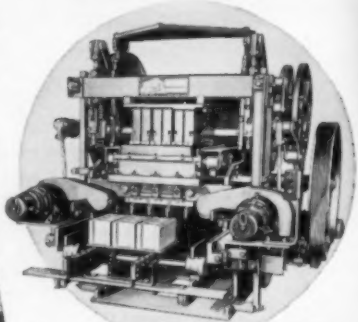

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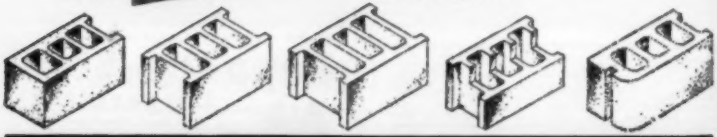

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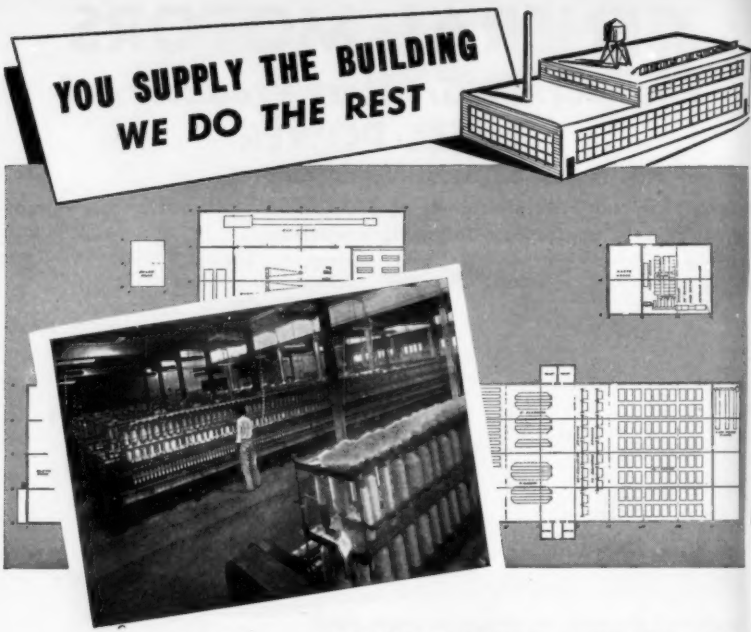

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5 Timely McGRAW-HILL BOOKS

PRODUCTION PLANNING and CONTROL

By THOMAS M. LANDY, Production Control Manager, Cleveland Trencher Company, *McGraw-Hill Industrial Organization & Management Series.* September, 1950. 436 pages, $5.50

This modern guide explains exactly **what** production planning and control is and **how** it is installed and operated. It shows how to coordinate the whole system—how to determine how, where, and at what cost to manufacture or assemble a product efficiently—how to order, expedite, and issue tools—how to provide the right kind and quantity of material at the right time—how to prepare and distribute the work order—how to ensure a sound, low-cost operation. This volume stresses the problem of organization planning and presents several unusual cases of complete installations of production planning and control. Forms and procedure to cover the various types of changes, and a brief résumé showing the relationship between forecasting and buying, manufacturing, and stocking are also included. The preparation of the Material List, combined scheduling, dispatching, and loading, and the latest development of factory order preparation are explained.

STREAMLINING BUSINESS PROCEDURES

By RICHARD F. NEUSCHEL, Management Consultant, McKinsey & Company. *McGraw-Hill Industrial Organization & Management Series.* August, 1950. 321 pages, $5.00

Development of improved operating routines and methods is an intrinsic part of every supervisory job, and tremendous opportunities are waiting to be exploited in this area. This book, the first to be devoted exclusively to the subject of procedures, establishes a body of practical, tested techniques for analyzing, simplifying, and improving procedures. The coverage of this book is comprehensive and includes the role of procedures in business management; the benefits of a thoroughgoing and continuous program of procedures research; how to organize, plan for, and administer a procedures program; how to make a procedures study; how to install new or revised procedures; how to develop and maintain procedures-instruction manuals. This volume brings together in a single, unified pattern the part that all levels of management—front-line supervisors, divisional executives, staff specialists, and top management—must plan in developing simple, orderly, and effective systems and procedures.

OUTLINES OF MARKETING. New Third Edition

By HUGH E. AGNEW, Professor Emeritus of Marketing, and HAROLD A. CONNER and WILLIAM L. DOREMUS, Associate Professors of Marketing, New York University. August, 1950. 432 pages. $4.25

The revision of this well-established text makes it one of the most compact and up-to-date books in the field. Changes in this new edition include: 1) The discussion of The United States as a Market is virtually all new. It considers the widespread shifts in the population and the resulting changes in the marketing procedures in the different states. 2) A new chapter on Merchandising and Sales Promotion has been added. 3) The chapters on Large Scale Retailing are practically all new; they reflect such revolutionary changes as department store chains, the establishment of suburban branches, widespread changes in the food stores. 4) The book reflects also changes in the functions of wholesalers, transportation, and many others.

HOW TO RUN A SMALL BUSINESS

By J. K. LASSER, C.P.A., Chairman, Institute of Federal Taxation, New York University. July, 1950. 350 pages, $3.95

This is a practical manual for the owners of retail stores and small plants, for wholesalers, and for managers of commercial offices. In very simple terms it explains the management, accounting, financing, insurance, and merchandising of the small business. It contains suggestions, statements, instructions, and advice on various business functions that can be used effectively by simply turning to the index to find out how to cope with whatever problem has arisen, what to do about a specific job of organizing or reorganizing, or when looking for suggestions in planning any normal or unusual business step.

BUILDING OPERATION and MAINTENANCE

By C. A. MARCH, Assistant to the Superintendent of Building Operation, The Detroit Edison Company. August, 1950. 384 pages. $6.00.

Here is practical information for everyday use by building owners, managers, and superintendents in the operation and maintenance of loft and office buildings, apartment houses, hospitals, schools, large dwellings, etc. Every important phase of building care is covered in the three general areas of management, operation, and maintenance. Here, conveniently grouped, are scores of detailed facts and pointers to help in the handling of all kinds of problems: writing a lease, putting out a fire, collecting a rent bill, maintaining the heating system, making an office layout, achieving economies in painting and cleaning, and many others. Importance of city fire and building regulations is stressed, and many safety precautions for boiler rooms, elevators, maintenance work, etc., are given.

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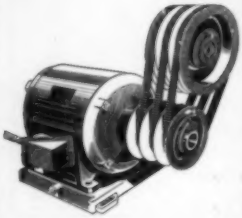

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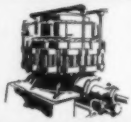

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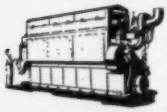

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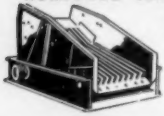

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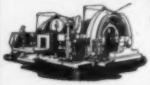

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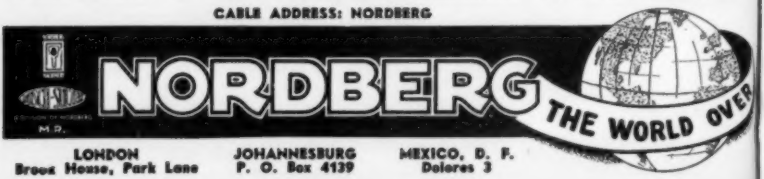

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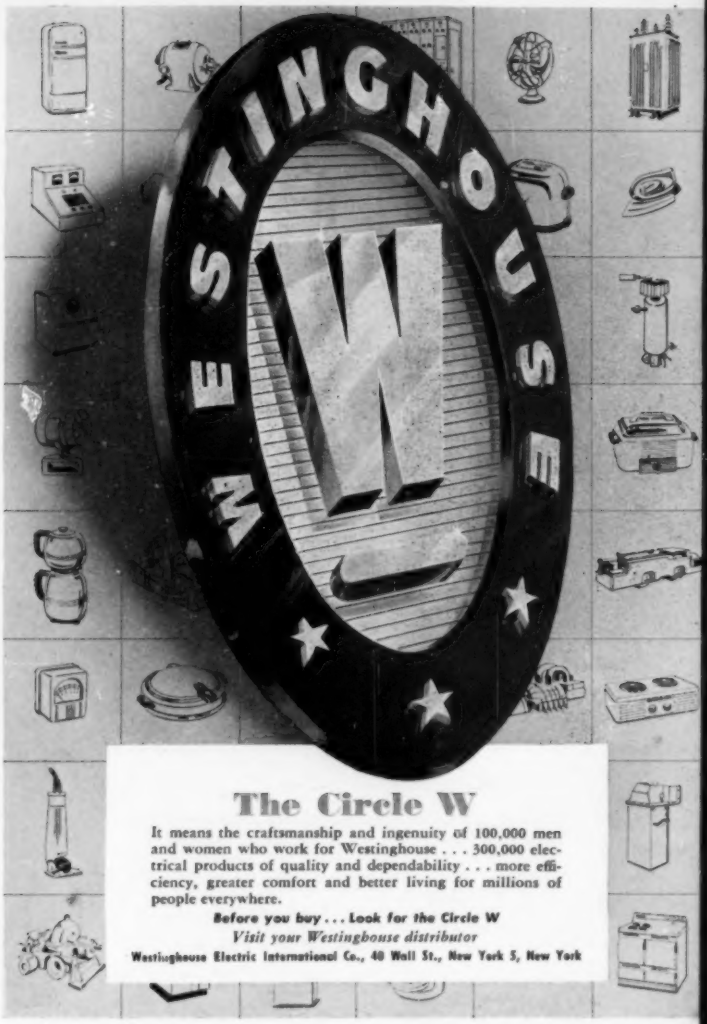

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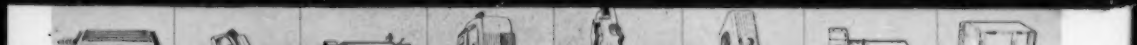
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